

1 UNIVERSAL MULTI-FUNCTIONAL COMMON CONDUCTIVE SHIELD STRUCTURE FOR
2 ELECTRICAL CIRCUITRY AND ENERGY CONDITIONING

3 Technical Field

4 This application is a continuation-in-part of copending application 09/579,606 filed May
5 26, 2000 which is a continuation-in-part of copending application Serial No. 09/460,218 filed
6 December 13, 1999, which is a continuation of application Serial No. 09/056,379 filed April 7,
7 1998, now issued as U.S. Patent Number 6,018,448, which is a continuation-in-part of
8 application Serial No. 09/008,769 filed January 19, 1998, which is a continuation-in-part of
9 application Serial No. 08/841,940 filed April 8, 1997, now issued as U.S. Patent Number
10 5,909,350. This application also claims the benefit of U.S. Provisional Application No.
11 60/136,451 filed May 28, 1999, U.S. Provisional Application No. 60/139,182 filed June 15,
12 1999, U.S. Provisional Application No. 60/146,987 filed August 3, 1999, U.S. Provisional
13 Application No. 60/165,035 filed November 12, 1999, U.S. Provisional Application No.
14 60/180,101 filed February 3, 2000, U.S. Provisional Application No. 60/185,320 filed February
15 28, 2000, U.S. Provisional Application No. 60/191,196 filed March 22, 2000, U.S. Provisional
16 Application No. 60/200,327 filed April 28, 2000, and U.S. Provisional Application No.
17 60/203,863 filed May 12, 2000.

18 Background of the Invention

19 The present invention relates to a layered, universal, multi-functional common
20 conductive shield structure with conductive feed-thru or by-pass pathways for circuitry and
21 energy conditioning that also possesses a commonly shared and centrally positioned
22 conductive pathway or electrode that can simultaneously shield and allow smooth energy
23 interaction between grouped and energized conductive pathway electrodes. The invention,
24 when energized, will allow the contained conductive pathways or electrodes to operate with
25 respect to one another harmoniously, yet in an oppositely phased or charged manner,
26 respectively. When placed into a circuit and energized, the invention will also provide EMI

27 filtering and surge protection while maintaining an apparent even or balanced voltage supply
28 between a source and an energy utilizing-load. The invention will also be able to simultaneous
29 and effectively provide energy conditioning functions that include bypassing, energy and signal
30 decoupling, energy storage, and continued balance in Simultaneous Switching Operations
31 (SSO) states of intergrated circuit gate. These conditioning functions are all provided without
32 contributing disruptive energy parasitics back into the circuit system as the invention is
33 passively operated within the circuit.

34 Electrical systems have undergone short product life cycles over the last decade. ^
35 system built just two years ago can be considered obsolete to a third or fourth generation
36 variation of the same application. Accordingly, passive componentry and circuitry built into
37 these the systems need to evolve just as quickly. However, the evolvment of passive
38 componentry has not kept pace. The performance of a computer or other electronic systems
39 has typically been constrained by the frequency operating speed of its slowest active
40 elements. Until recently, those elements were the microprocessor and the memory
41 components that controlled the overall system's specific functions and calculations. However,
42 with the advent of new generations of microprocessors, memory components and their data,
43 the focus has changed. There is now intense pressure upon the industry to provide the
44 system user with increased processing power and speed at a decreasing unit cost. EMI
45 created in these environments must also be eliminated or minimized to meet international
46 emission and/or susceptibility requirements. Since 1980, the typical operating frequency of the
47 mainstream microprocessors has increased approximately 240 times, from 5 MHz (million
48 cycles per second) to approximately to 1200 MHz+ by the end of the year 2000. Processor
49 frequency operating speed is now matched by the development and deployment of ultra-fast
50 RAM architectures. These breakthroughs have allowed boosting of overall system frequency
51 operating speeds of the active componentry past the 1 GHz mark. During this same period,
52 however, passive componentry technologies have failed to keep up with these new

53 breakthroughs and have produced only incremental changes in composition and
54 performance. These advances in passive component design and changes have focused
55 primarily upon component size reduction, slight modifications of discrete component electrode
56 layering, dielectric discoveries, and modifications of device manufacturing techniques or rates
57 of production that decrease unit production cycle times.

58 In the past, system engineers have solved design problems by increasing the number of
59 passive components placed into the electrical circuit. These solutions generally have involved
60 adding inductors and resistors that are used with prior art capacitors to perform separate
61 functions such as filtering, decoupling, and surge protection. Although there have been a few
62 devices that are able to perform more than one function simultaneously, these devices consist
63 of passive networks that require additional supporting componentry.

64 Not to be overlooked, however, is the existence of a major limitation in the line
65 conditioning ability of these passive networks and prior art single passive components. This
66 limitation presents both an obstacle for technological progression and an obstacle for
67 economic growth in the electronic and computer industry and remains as one of the last
68 remaining challenges of the +GHz speed systems. The focus of constraint to high-speed
69 system performance is centered upon the physical architectural limitations that make-up the
70 supporting passive componentry that in turn helps deliver and condition the propagated energy
71 and data signals going to and from the processors, memory technologies, and those additional
72 systems located outside of a particular electronic system.

73 A single passive component generally has a physical functional line conditioning
74 limitation of between 5 and 250 MHz. At higher frequencies, for the most part, a load still
75 requires combinations of discrete passive elements for "lump" elements such as various L-C-
76 R, L-C, and R-C networks to shape or control energy delivered to the system load. However,
77 at frequencies above 200-250 MHz, these prior art, discrete L-C-R, L-C, R-C networks begin to
78 take on characteristics of transmission lines and even microwave-like features rather than

79 providing lump capacitance, resistance or inductance that such a network was designed
80 for. This performance disparity has appeared in the form of circuit system anomalies or failures
81 over the last 2-3 years in circuitry between the higher operating frequency of microprocessors,
82 clocks, power delivery bus lines, and memory systems, and that of the supporting passive
83 elements, has resulted in system failures.

84 Additionally, at these higher frequencies, energy pathways should normally be grouped
85 or paired as an electrically complementary element or elements that work together electrically
86 and magnetically in harmony and in balance within an energized system. Attempts to line
87 condition propagating energy with prior art componentry has led to increased levels of
88 interference in the form of EMI, RFI, and capacitive and inductive parasitics. These increases
89 are due in part to imbalances and performance deficiencies of the passive componentry that
90 create or induce interference into the associated electrical circuitry. This has created a new
91 industry focus on passive componentry whereas, only a few years ago, the focus was primarily
92 on the interference created by the active components from sources and conditions such as
93 voltage imbalances located on both sides of a common reference or ground path, spurious
94 voltage transients from power surges, human beings, or other electromagnetic wave
95 generators.

96 At higher operating speeds, EMI can also be generated from the electrical circuit
97 pathway itself, which makes shielding from EMI desirable. Differential and common mode
98 noise energy can be generated and will traverse along and around cables, circuit board tracks
99 or traces, and along almost any high-speed transmission line or bus line pathway. In many
100 cases, energy fields that radiate from these critical energy conductors act as an antenna,
101 hence aggravating the problem even more. Other sources of EMI interference are generated
102 from the active silicon components as they operate or switch. These problems such as SSO
103 are notorious causes of circuit disruptions. Other problems include unshielded and parasitic

104 energy that freely couples upon or onto the electrical circuitry and generates significant
105 interference at high frequencies.

106 Other disruptions to a circuit derive from large voltage transients, as well as ground loop
107 interference caused by varying ground potentials which can render a delicately balanced
108 computer or electrical system, useless. Existing surge and EMI protection devices have been
109 unable to provide adequate protection in a single integrated package. Varieties of discrete and
110 networked lump filters, decouplers, surge suppression devices, combinations, and circuit
111 configurations have proven ineffectual as evidenced by the deficiency of the prior art.

112 U. S. Patent Application 09/561,283 filed on April 28, 2000 and U. S. Patent Application
113 09/579,606 filed on May 26, 2000 by the applicants relate to continued improvements to a new
114 family of discrete, multi-functional energy conditioners. These multi-functional energy
115 conditioners possess a commonly shared, centrally located, conductive electrode of a structure
116 that can simultaneously interact with energized and paired conductive pathway electrodes
117 contained in energy-carrying conductive pathways. These energy-carrying conductive
118 pathways can operate in an oppositely phased or charged manner with respect to each other
119 and are separated from one another by a physical shielding. This application expands upon
120 this concept and further discloses a new width and breadth of additional and unobvious
121 embodiment variations of what the applicants believe to be a new universal system of circuit
122 protection and conditioning that will help solve or reduce industry problems and obstacles with
123 simplicity and exponential effectiveness. Variations of the invention can also use many
124 commonly found and accepted materials and methodologies for its production. The applicants
125 also believe this the invention and its variations to be a universally exploitable solution that is
126 cost effective by today's economic standards and that it will have a longevity of usages,
127 despite the ever-increasing operating frequencies of future circuits. The applicants also believe
128 this the invention and its variations that can be created will minimize production and logistical
129 discontinuities for any adopters of the technology. Variations of the invention use commonly

130 found and accepted materials and methodologies for its production which can
131 minimize production and logistical discontinuities for any adopters of the technology.
132 Manufacturing infrastructure is provided with an unprecedented ease of adaptability or
133 production changeover as compared to the prior art.

134 Summary of the Invention

135 Based upon the foregoing, there has been found a need to provide a layered, multi-
136 functional, common conductive shield structure containing energy-conductive pathways that
137 share a common and centrally positioned conductive pathway or electrode as part of a
138 structure which allows for energy conditioning as well as a multitude of other functions
139 simultaneously, within one inclusive embodiment or embodiment variation that possesses a
140 commonly shared and centrally positioned conductive pathway or electrode as part of its
141 structure. The layered, multi-functional, common conductive shield structure also provides
142 simultaneous physical and electrical shielding to portions of propagating energy by allowing
143 predetermined, simultaneous energy interactions to take place between grouped and
144 energized conductive pathways and various conductive pathways external to the embodiment
145 elements.

146 Existing prior art discrete decoupling capacitors lose their effectiveness at about 500
147 MHz. For example, mounting inductance for 0603 size capacitors has been reduced to
148 approximately 300 pH. Assuming 200 pH for the internal capacitance of the capacitors, this
149 equates to a total of 500 pH, which corresponds to 942 mOhms at 500 MHz. Accordingly,
150 current discrete capacitors are not effective. While it is possible to use the series resonant
151 frequency and low ESR capacitors to drive towards a low impedance at 500 MHz, the
152 capacitance required to obtain 500 MHz with 500 pH ESL is about 200 pF. Current prior
153 devices get 225 pF for every square inch of power planes which would require more than one
154 discrete capacitor every square inch. A superior approach is to get the low impedance from
155 the power planes. It is impractical to utilize many low impedance decoupling capacitors on a

156 PCB if low impedance power planes are not available to hook them up. Accordingly, the
157 solution to low impedance power distribution above several hundred MHz lies in thin dielectric
158 power plane technology, in accordance with the present invention, which is much more
159 effective than discrete decoupling capacitors. Therefore, it is also an object of the invention to
160 be able to operate effectively across a broad frequency range as compared to a single
161 component or a multiple passive conditioning network. Ideally, this invention can be universal
162 in its application potentials, and by utilizing various embodiments of predetermined grouped
163 elements, a working invention will continue to perform effectively within a system operating
164 beyond 1 GHz of frequency.

165 It is an object of the invention to be able to provide energy decoupling for active system
166 loads while simultaneously maintaining a constant, apparent voltage potential for that same
167 portion of active componentry and its circuitry.

168 It is an object of the invention to minimize or suppress unwanted electromagnetic
169 emissions resulting from differential and common mode currents flowing within electronic
170 pathways that come under the invention influence.

171 It is an object of the invention to provide a multi-functional, common conductive shield
172 and energy conditioning structure for conductive energy pathways which can take on a wide
173 variety of multi-layered embodiments and utilize a host of dielectric materials, unlimited by their
174 specific physical properties that can, when attached into circuitry and energized, provide
175 simultaneous line conditioning functions and protections as will be described.

176 It is an object of the invention to provide the ability to the user to solve problems or
177 limitations not met with prior art devices which include, but are not limited to, simultaneous
178 source to load and/or load to source decoupling, differential mode and common mode EMI
179 filtering, containment and exclusion of energy parasitic containment and exclusion, as well as
180 surge protection in one integrated embodiment and that performs these described abilities

181 when utilizing a conductive area or pathway external to the originally manufactured
182 embodiment.

183 It is an object of the invention to be easily adapted to utilization with one or more
184 external conductive attachments to a conductive area located external to the originally
185 manufactured invention which can aid the invention embodiments in providing protection to
186 electronic system circuitry. Additionally, protection is offered from an in-service to active
187 electronic components from electromagnetic field interference (EMI), over voltages, and
188 debilitating electromagnetic emissions contributed from the invention itself, which in prior art
189 devices would be contributed as parasitics back into the host circuitry.

190 It is an object of the invention to provide a physically integrated, shield-containment,
191 conductive electrode architecture for the use with independent electrode materials and/or an
192 independent dielectric material composition, that when manufactured, will not limit the
193 invention to a specific form, shape, or size for the multitude of possible embodiments of the
194 invention that can be created and is not limited to embodiments shown herein.

195 It is an object of the invention to provide a user with an embodiment that gives the user
196 the ability to realize a comparatively inexpensive, miniaturized, solution that would be available
197 for integration and incorporation into a plurality of electronic products.

198 It is an object of the invention to provide an embodiment free of the need of using any
199 additional discrete passive components to achieve the desired filtering and/or line conditioning
200 that prior art components are unable to provide.

201 It is an object of the invention to provide an embodiment giving the user an ability to
202 realize an easily manufactured, adaptable, multi-functional electronic embodiment for a
203 homogenous solution to a wide portion of the electrical problems and constraints currently
204 faced when using prior art devices.

205 It is another object of the invention to provide an embodiment in the form of discrete or
206 non-discrete devices, or pre-determined groupings of conductive pathways, that form a multi-

207 functioning electronic embodiment, that when attached to an external conductive pathway or
208 a pre-determined conductive surface, operates effectively across a broad frequency range and
209 simultaneously provides energy decoupling for active circuit componentry, while maintaining a
210 constant apparent voltage potential for portions of circuitry.

211 It is another object of the invention to provide an embodiment in the form of discrete or
212 non-discrete devices, or pre-determined groupings of conductive pathways, that form a multi-
213 functioning electronic embodiment to provide a blocking circuit or circuits utilizing an inherent
214 common conductive pathway inherent to the embodiment, which is combined with an external
215 conductive surface or ground area to provide connection to an additional energy pathway from
216 the paired conductive pathway conductors for attenuating EMI and over voltages.

217 It is another object of the invention to provide an embodiment that utilizes standard
218 manufacturing processes and be constructed of commonly found dielectric and conductive or
219 conductively made materials to reach tight capacitive tolerances between electrical pathways
220 within the embodiment while simultaneously maintaining a constant and uninterrupted
221 conductive pathway for energy propagating from a source to an energy utilizing load.

222 Lastly, it is an object of the invention to provide an embodiment that couples pairs of
223 electrical conductors very closely in relation to one another into an area or space partially
224 enveloped by a plurality of commonly joined conductive electrodes, plates, or pathways, and
225 can provide a user with a choice of selectively coupling external conductors or pathways on to
226 separate or common conductive pathways or electrode plates located within the same
227 embodiment.

228 Numerous other arrangements and configurations are also disclosed which implement
229 and build on the above objects and advantages of the invention in order to demonstrate the
230 versatility and wide spread application of a universal, multi-functional, common conductive
231 shield structure with conductive pathways for energy and EMI conditioning and protection,
232 within the scope of the present invention.

233 Brief Description of the Drawings

234 FIG. 1 shows a top view of a portion of a Faraday cage-like shield structure portion of
235 the present invention;

236 FIG. 2 shows an exploded perspective view of a portion of the present invention
237 comprising an interconnected, parallel, common conductive shield structure;

238 FIG. 2B shows an exploded perspective view of a portion of the present invention
239 comprising an interconnected, parallel, common conductive shield structure as shown in Fig. 2
240 and a depiction of differential conductive pathways operating within the structure and the field
241 motion as energy is undergoing conditioning within the structure.

242 FIG. 3A shows an exploded cross-section view of a layered by-pass arrangement of an
243 embodiment of the present invention with outer image shields;

244 FIG. 3B shows a second exploded cross-sectional view of a layered by-pass as shown
245 in FIG. 3A and rotated 90 degrees there from;

246 FIG. 4A shows an exploded, perspective view depicting four common conductive cage-
247 like structure containers as shown in FIG. 2 for comparison to a non-discrete universal multi-
248 functional common conductive shield structure with feed-thru pathways (UMFCCSS-F) shown
249 in FIG. 4B; FIG. 4B shows an exploded view depicting four common conductive cage-like
250 structure containers with conductive pathways that make up a universal multi-functional
251 common conductive shield structure with feed-thru pathways (UMFCCSS-F);

252 FIG. 4C shows an exploded, perspective view depicting four common conductive cage-
253 like structure containers shown in FIG. 2 for comparison to a non-discrete universal multi-
254 functional common conductive shield structure with bypass pathways (UMFCCSS-B) shown in
255 FIG. 4D

256 FIG. 4D shows an exploded view depicting four common conductive cage-like structure
257 with common conductive pathway electrode layers like that shown in FIG. 4C for use as a
258 universal multi-functional common conductive shield structure with bypass pathways

259 (UMFCCSS-B) when used as a non-discrete embodiment that can be manufactured into a
260 PCB or substrate or a portion of a silicon die such as in a die made into a MPU, DSP or the
261 like (micro processor unit or digital signal processor or any other silicon and/or copper based
262 dice or die);

263 FIG. 5A represents a frozen moment in time taken of an exploded and inside-out view
264 or depiction of a minimally configured 5-conductive pathway electrode layering within a
265 UMFCCSS 3800 (in-bypass) placed into a simple circuit arrangement and energized with
266 propagating energy.

267 FIG. 5B is a partial cross sectional view of the snap shot taken of the invention placed
268 into an electrical system as shown in FIG. 5A;

269 FIG. 5C shows a data graph comparing same size and similar capacitive value
270 embodiments of a universal multi-functional common conductive shield structure with bypass
271 pathways (UMFCCSS-B) made in MOV dielectric and X7R dielectric and tested to 500 MhZ in
272 a circuit system similar to that shown in FIG. 5A and FIG. 5B

273 FIG. 5D is a data graph comparing various attachments and non-attachments of
274 common conductive termination structures of a universal multi-functional common conductive
275 shield structure with bypass pathways (UMFCCSS-B) and an external conductive surface
276 common to all termination structures run out to 1,200 MhZ.

277 Detailed Description of the Preferred Embodiment

278 As used herein, the acronym terms "UMFCCSS" refers to all types both discrete and non-
279 discrete versions of multi-functional common conductive shield structure with conductive
280 pathways, "UMFCCSS-F" refers to both discrete and non-discrete versions of multi-functional
281 common conductive shield structure with conductive feed-thru pathways. The term
282 "UMFCCSS-B" refers to both discrete and non-discrete versions of multi-functional common
283 conductive shield structure with conductive by-pass pathways for all disclosure purposes.

284 In addition, as used herein, the acronym term "AOC" for the words
285 "predetermined area or space of physical convergence or junction" which is defined as the
286 physical boundary of manufactured-together invention elements. Non-energization and
287 energization are defined as the range or degree to which electrons within the "AOC" are in
288 motion and are propagating to and/or from an area located outside the pre-determined
289 boundary of an electrical conductive pathway or energized circuit pathway that contains either
290 discrete and non-discrete versions of UM FCCSS AOC so, that propagated energy reacts with
291 invention elements and/or combinations of elements to conduct a phased or charge
292 exchange of electrons in a balanced manner.

293 The invention begins as a combination of electrically conductive, electrically semi-
294 conductive, and non-conductive dielectric independent materials, layered or stacked in various
295 embodiments such as discrete and non-discrete structures. These layers can be combined to
296 form a unique circuit when placed and energized in a system. The invention embodiments
297 include layers of electrically conductive, electrically semi-conductive, and non-conductive
298 planes that form groups of common conductive pathway electrodes, conductors, deposits,
299 plates (all referred to as 'pathways', herein), and dielectric planes. These layers are oriented
300 in a generally parallel relationship with respect to one another and to a predetermined pairing
301 or groups of elements that also include various combinations of pathways and their layering
302 into a predetermined structure that is universal in the type of embodiments that can be
303 manufactured. Other elements can include some means of conductively coupling the common
304 conductive planes. These devices are not just limited to dielectric layers, multiple electrode
305 conductive pathways, sheets, laminates, deposits, multiple common conductive pathways,
306 shields, sheets, laminates, or deposits. The invention also includes element methods to
307 combine them together in an interweaved arrangement of overlapping and non-overlapping
308 methodologies that also connects specific types of planes together for energization into a
309 larger electrical system in a predetermined manner. This manner yields distinct electrical circuit

310 functions, some heretofore not found, occurring both effectively and simultaneously,
311 that was normally performed with multiple embodiments of prior art devices. When or after the
312 structured layer arrangement is manufactured, it can be shaped, buried within, enveloped, or
313 inserted into various electrical systems or other sub-systems. The circuit of the structure can
314 easily be combined with almost any larger circuitry to perform line conditioning, decoupling,
315 and/or aid in modifying an electrical transmission of energy to a desired electrical form or
316 electrical shape. The invention can be a separate, stand-alone embodiment or manufactured
317 as a group and integral to a larger electrical structure such as an integrated circuit. It can also
318 exist as a non-energized stand alone discrete device that can be energized with a combination
319 as a sub-circuit for larger circuitry found in other embodiments such as, but not limited to, a
320 Printed Circuit Board (PCB), interposer, substrates, connectors, integrated circuits, or atomic
321 structures. An alternative invention embodiment can also be built primarily as another device
322 such as a PCB, interposer, or substrate that has a purpose mainly other than that of a smaller
323 discrete version of the invention. This alternate type of embodiment serves as a possible
324 system or subsystem platform that contains both active and passive components along with
325 circuitry, yet is layered to provide most of the benefits described for conditioning propagated
326 energy from a source to a load and back to a return. PCBs are already utilizing predetermined
327 layered configurations with VIAs to service or tap the various power, signal, and ground layers
328 that lie between a dielectric and insulating material. The characteristics described herein can
329 easily be obtained from such a device.

330 By surrounding the conductive pathway electrode planes with the Faraday cage-like
331 structures made up with one centralized and shared, common conductive pathway or area, the
332 pathway or plane becomes a 0-reference ground plane for circuit voltages between the two
333 oppositely phased or potential conductive structures located on opposite sides of the central,
334 shared, common conductive layer. This configuration aids significantly in eliminating and
335 suppressing E-Fields and H-fields, stray capacitances, stray inductances, parasitics, and

336 allowing for mutual cancellation of oppositely charged or phased, adjoining or abutting,
337 electrical fields of the variously positioned signal, power and return pathways. An external
338 conductive connection for a PCB built with the device can take advantage of the various
339 grounding schemes used now by large PCB manufacturers.

340 To propagate electromagnetic interference energy, two fields are required, an electric
341 field and a magnetic field. Electric fields couple energy into circuits through the voltage
342 differential between two or more points. Changing electrical fields in a space give rise to a
343 magnetic field. Any time-varying magnetic flux will give rise to an electric field. As a result, a
344 purely electric or purely magnetic time-varying field cannot exist independent of each other. A
345 passive architecture, such as utilized by the invention, can be built to condition or minimize
346 both types of energy fields that can be found in an electrical system. While the invention is not
347 necessarily built to condition one type of field more than another, however, it is contemplated
348 that different types of materials can be added or used to build an embodiment that could do
349 such specific conditioning upon one energy field over another.

350 Today's higher operating frequencies of circuitry, for the most part, require the user to develop
351 combinations of single or multiple passive elements such as inductors, capacitors, or resistors
352 and to create L-C-R, L-C, and R-C discrete component networks used to control energy
353 delivered to a system load. However, prior art, discrete, L-C-R, L-C, R-C component networks,
354 at frequencies above 200 MHz, begin to take on characteristics of transmission lines, or can
355 even exhibit microwave-like features at still higher frequencies. Use of prior art components
356 within these situations can allow unsuppressed or undiminished parasitics from the conductive
357 pathways located internal to prior art devices or radiating from the connection structures that
358 combine externally between all of the discrete elements into the network, to degrade, slow
359 down, or otherwise contribute noticeable degradation of the energy propagating along the
360 circuit over a wide range of frequency operations. This can be substantially harmful to the
361 larger circuit the network is attached. Rather than providing a lump capacitance, resistance, or

362 inductance that such a network was designed for, at higher frequencies, these capacitive
363 parasitics that are attributed to the internal electrodes located inside prior art component
364 networks can be the sources of energy degradation, voltage and capacitive imbalance
365 between differentially paired lines causing debilitation or sub-specified performance to the
366 circuit as a whole. The sub-specified performance and energy losses such as attributed to
367 data drop, line delays, etc. and can contribute to measurable circuit inefficiency.

368 As for all embodiments of the present invention depicted and those not pictured, the
369 applicant contemplates a manufacturer to have the option in some cases for combining a
370 variety and wide range of possible materials that are selected and combined into the material
371 make-up of the invention when manufactured, while still maintaining some or all of the desired
372 degree of electrical functions of the invention.

373 Thus, materials for composition of the invention can comprise one or more layers of
374 material elements compatible with available processing technology and is not limited to any
375 possible dielectric material. These materials may be a semiconductor material such as silicon,
376 germanium, gallium-arsenide, or a semi-insulating or insulating material and the like such as,
377 but not limited to any K, high K and low K dielectrics. Equally so, the invention is not limited to
378 any possible conductive material, magnetic, nickel-based materials, MOV-type material, ferrite
379 material, films such as Mylar, any substances and/or processes that can create conductive
380 pathways for a conductive material, and any substances and/or processes that can create
381 conductive areas such as, but not limited to, doped polysilicons, sintered polycrystallines,
382 metals, or polysilicon silicates, polysilicon silicide.

383 The invention removes an obstacle capacitive load balancing between
384 ENERGIZED paired or multiple lines much differently than that of two discrete capacitors
385 PLACED IN A CIRCUIT AND CONNECTED TO A RETURN PATH, WHICH IS KNOWN AS
386 BYPASS DECOUPLING. PRIOR ART CAPACITORS manufactured in the same production
387 batch which can easily possess a variability in capacitance, ranging anywhere from 15% - 25%.

388 THUS, WHEN PRIOR ART CAPACITORS ARE PLACED INTO A CIRCUIT AND
389 ENERGIZED, THE MANUFACTURING TOLERANCES ARE CARRIED TO THE CIRCUIT, IN
390 THIS CASE A DIFFERENTIAL PAIRED CIRCUIT AND THESE CAPACITIVE IMBALANCES
391 ARE MULTIPLIED AND CAUSE A VOLTAGE IMBALANCE IN THE CIRCUIT. EVEN WHEN
392 prior art units ARE MADE for example, while it is possible to obtain individual variations of
393 capacitance between discrete units of less than 10%, it is however, at a cost or a substantial
394 premium that must be paid by the user over the common dielectrics in order for the
395 manufacturer to recover the costs for testing, hand sorting manufactured lots, as well as the
396 additional costs for the more specialized dielectrics and manufacturing techniques that are
397 needed to produce these devices with reduced individual variance differences required for
398 differential signaling. The invention allows the use of very inexpensive dielectric materials
399 (relative to the others available) to be used to obtain balance between two differential lines.
400 Industry manufacturing standards are such that a precise amount of dielectric and conductive
401 plate materials can be laid or made for use in a standard passive component such as a
402 capacitor. This process has excellent control structures to insure a variance of from 1% to 5%
403 between discrete units of the same batch. Use of the invention will allow PLACEMENT INTO A
404 DIFFERENTIALLY OPERATED CIRCUIT OR ANY PAIRED LINE CIRCUITRY THAT WILL
405 PROVIDE BALANCED AND ESSENTIALLY EQUAL CAPACITIVE TOLERANCES OF ONE
406 INVENTION UNIT THAT IS SHARED AND BETWEEN EACH OF A PAIRED LINE, EQUALLY,
407 IN AN ELECTRICAL MANNER. INVENTION tolerances or capacitive balance between a
408 commonly shared central conductive pathway found internally within the invention to be
409 maintained at levels THAT ORIGINATED AT THE FACTORY DURING MANUFACTURING
410 EVEN WITH THE USE OF X7R Dielectric WHICH is widely and commonly specified with as
411 much as 20% or allowable capacitive variation among discrete units of the same
412 manufacturing run. USE OF ONE INVENTION UNIT BETWEEN ENERGIZED PAIRED LINES
413 RATHER THAN PRIOR ART UNITS WILL ALLEVIATE THE ELECTRONIC INDUSTRY

414 PROBLEM OF CAPACITIVE DIFFERENCE INTRODUCE BETWEEN A PAIRED LINE,
415 PARTICULARLY AT SENSITIVE HIGH FREQUENCY OPERATION. When the universal
416 multi-functional common conductive shield structure is manufactured and subsequently
417 attached to an externally manufactured conductive pathway (not of), separate from the
418 differential pathways that are also utilizing the invention embodiment, the device will
419 simultaneous provide energy conditioning functions that include bypassing, energy, power line
420 decoupling, energy storage such that the differential electrodes that are enveloped within the
421 shield structure are free from almost all internally generated capacitive or energy parasitics
422 trying to escape from the enveloped containment area surrounding the conductive pathway
423 electrode and at the same time, will act to prevent any externally generated capacitive or
424 energy parasitics such as "floating capacitance" from coupling onto the very same differential
425 conductive pathways due to the physical shielding, separate of the electrostatic shield effect
426 created by the energization of the common conductive structure and its attachment with
427 common means know to the art to an externally located conductive area.

428 Thus, these parasitics of all types are prevented or minimized from upsetting the
429 capacitive balance that was manufactured into the unenergized invention and is contrary to
430 what occurs with every other prior art unit not using the conductive shield structure. Prior art
431 has always allowed effects from free parasitics in both directions to disrupt a circuit despite the
432 best attempts to the contrary with all prior art devices to date.

433 Thus a device that is manufactured at 1% tolerance, when manufactured as described
434 in the disclosure will also have a correlated 1% capacitive tolerance between paired lines in an
435 energized system and also as an added benefit exchange two prior art devices for bypassing
436 paired lines with one invention embodiment. The new device is placed between paired or a
437 paired plurality of differential conductive pathways, while the common conductive pathways
438 that also make up the invention are connected to a third conductive pathway that is common to
439 all elements of the common conductive pathways and is the external conductive area. Thus,

440 expensive, non-commonly used, specialized, dielectric materials are no longer needed for
441 delicate bypass and/or decoupling operations in an attempt to maintain a capacitive balance
442 between two system conductive pathways, as well as giving an invention users the opportunity
443 to use a capacitive element that is homogeneous in material make up with in the entire circuit.

444 Attachment to an external conductive area includes areas such as commonly described
445 as a "floating", non-potential conductive area, a circuit system return, chassis or PCB ground,
446 or even an earth ground. The invention through other functions such as cancellation of
447 mutually opposing conductors allows a low impedance pathway to develop within the Gauss
448 Faraday cage-like units with respect to the enveloping conductive common shields pathways
449 that can subsequently continue to move energy out onto the externally located conductive
450 area, thus completing an energy pathway of low impedance for unwanted EMI noise as well.
451 This attachment scheme normally will allow a "0" voltage reference to develop with respect to
452 each differential conductor located on opposite sides of the shared central and common
453 conductive pathway, its termination structures, if any and the externally used conductive
454 surface. Thus, on situations such the need in high frequency applications to maintain a voltage
455 balance between a source and an energy utilizing load, the invention is an ideal and universal
456 solution. Thus the voltage is maintained and balanced even with SSO (Simultaneous Switching
457 Operations) states among gates located within an integrated circuit and without contributing
458 disruptive energy parasitics back into the circuit system as the invention is passively operated,
459 within.

460 Discrete Passive Components employ surface mount technology to physically and electrically
461 connect to external electrical conductors and traces or pathways found on/in, but not limited to,
462 Printed Circuit Boards (PCB), multi-silicon chip module (MCM), silicon chip scale packages
463 (CSP), Interposer, Substrates, Connectors, Integrated Circuits. The present invention may
464 exist in innumerable embodiments. As an example of various types of layered configurations
465 contemplated, but not intended to limit the invention, various additional embodiments of multi-

466 component filters will be described. In each figure, the five pathways are shown
467 individually and then in a top plan view and finally in a side view. Another variation of the
468 invention relates to improvements to multi layered electronic circuit conditioning assemblies
469 that consists of a physical layering architecture that suppresses unwanted electromagnetic
470 emissions, both those unwanted electromagnetic emissions received from other sources and
471 those created internally within the multi layered electronic circuit conditioning assemblies'
472 internal electronic circuitry such as differential and common mode currents. In addition, due to
473 the inventions' physical architecture and variety of materials that can make up its' composition,
474 over voltage surge protection and magnetic properties can be integrally incorporated with
475 many versions or variations of the multi layered electronic circuit conditioning assemblies
476 including, but not limited to decoupling, by-passing to ground, differential and common mode
477 filtering functions and the like.

478 As previously, noted, propagated electromagnetic interference can be the product of
479 both electric and magnetic fields, respectively. Until recently, emphasis in the art has been
480 placed upon on filtering EMI from circuit or energy conductors carrying high frequency noise
481 with DC energy or current. However, the invention is capable of conditioning energy that uses
482 DC, AC, and AC/DC hybrid-type propagation of energy along conductive pathways found in an
483 electrical system or test equipment. This includes use of the invention to condition energy in
484 systems that contain many different types of energy propagation formats found in systems
485 containing many kinds of circuitry propagation characteristics within the same electrical system
486 platform. The main cause of radiated emission problems can be due to the two types of
487 conducted currents, differential and common mode energy. The fields generated by these
488 currents result in many types of EMI emissions. Differential mode (DM) currents are those
489 currents that flow in a circular path in wires, circuit board traces, and other conductors. The
490 fields related to these currents originate from the loop defined by the conductors. Without

491 limiting the invention in any way, an example of an assembly in accordance with the
492 invention is provided below.

493 Principals of a Faraday cage-like structure are used when the common plates are joined
494 to one another and the grouping of common conductive pathways together coact with the
495 larger external conductive area or surface to suppress radiated electromagnetic emissions and
496 provide a greater conductive surface area in which to dissipate over voltages and surges and
497 initiate Faraday cage-like electrostatic suppression of parasitics and other transients,
498 simultaneously. This is particularly true when a plurality of common conductive pathways
499 electrically coupled to system, chassis ground and is relied upon for reference ground for a
500 circuit in which the invention is placed into and energized. As mentioned earlier, one or more
501 of a plurality of materials having different electrical characteristics can be inserted and
502 maintained between common conductive pathways and both electrode pathways. Differential
503 layered termination structures are always separated electrically from one another in the circuit
504 and do not touch within the device. They are always separated physically from one another by
505 an interposing pair of common pathway(s) or a single pathway and dielectric material. The
506 Faraday cage-like structure or configuration concept of the present invention is shown in detail.
507 According to the present invention, FIG. 1 comprises a portion of the Faraday cage-
508 structure 800 that consists of two areas of space that sandwiches one of two differential
509 electrodes. Conductive electrode pathway 809 is sandwiched between central common
510 conductive shared pathway 804 and common conductive pathway 808 (not shown). Common
511 conductive pathways 804, 808 (not shown) and 810 (not shown) are all separated from each
512 other by a general parallel interposition of a predetermined dielectric material and between
513 each outside pathway 810 and 808 relative to each pathways respective position to the central
514 common conductive shared pathway 804, by differential conductive electrode pathways 809
515 and 809' (not shown) that feature a differential conductive electrode such as conductive
516 pathway 809 almost completely covered or shielded by pathways 808 and 804, respectively

517 that are sandwiching pathway 809, in this case, above and below, within the invention.
518 The pathways 804, 808, and 810 are also surrounded by dielectric material 801 that provides
519 support and an outer casing of the component. A means to allow connection of both common
520 shield termination structures 802 to the same common conductive pathways 808 and 804 and
521 810 individually is desired. When the entire invention is placed into circuitry, termination
522 structures 802 should be attached by standard means known in the art to the same external
523 conductive area or to the same external conductive path (not shown) without an interruption or
524 conductive gap between each respective termination structure. A standard means known in
525 the art facilitates connection of common shield termination structures 802 that attached
526 respectively on all three pathways 804, 808, and 810 together will form a single structure 800
527 to act as one common conductive cage-like structure of 800. Although not shown, 800' mirrors
528 single Faraday cage-like structure 800 except that differential electrode 809' contained within
529 has a exit/entrance section 812A (not shown) that is not fully shielded, but in a generally
530 opposing direction of 180 degrees to that of conductive termination structure 809' and
531 differential electrode 809 to join with conductive termination structure 809A' (not shown).
532 These two Faraday cage-like structures 800 and 800' are in a positioned and parallel
533 relationship, but most importantly structures 800 and 800' are sharing the same, central
534 common conductive shared pathway 804, layer or pathway that makes up each Faraday cage-
535 like structure 800 and 800' when taken individually. Together 800 and 800' create a single and
536 larger conductive Faraday cage-like shield structure 800'' (not shown) that acts as a double
537 container. Each container 800 and 800' will hold an equal number of same sized differential
538 electrodes that are opposing one another within said larger structure 800'' in a generally
539 parallel manner, respectively. Larger conductive Faraday cage-like shield structure 800'' with
540 coacting 800 and 800' individual shield-like structures when energized and attached to the
541 same external common conductive path become one electrically. At energization, the
542 predetermined arrangement of the common conductive electrodes into a differential conductive

sandwich with a centralized common shield are elements that make up one common conductive cage-like structure 800" which is the base element of the present invention, namely the Faraday cage-like structure 800". The structure in essence, forms minimum of two Faraday cages 800 and 800' that are required to make up a multi-functional line-conditioning device in all of the layered embodiments of the present invention. The central common conductive shared pathway 804 with respect to its interposition between the differential electrodes needs the outer two additional sandwiching common electrode pathways 808 and 810 to be considered an un-energized Faraday cage-like structure 800". To go further, the central common pathway 804 will be simultaneously used by both differential electrodes 809 and 809' at the same time, but with opposite results with respect to charge switching. It must be noted that for most chip, non-hole thru embodiments, a new device will have a minimum of two electrodes sandwiched between three common conductive electrodes and connected external termination structures that are connected such that they are conductively as one to form a single, larger Faraday-cage-like structure 800", that when attached to a larger external conductive area, helps perform simultaneously energized line conditioning and filtering functions upon the energy propagating along the conductors and sandwiched with the cage-like structure 800" in an oppositely phased or charged manner. The now attached internal common conductive electrode pathways that make up the Faraday cage-like structure and subsequent energization, will allow the external conductive area or pathway to become, in essence, an extended, closely positioned, and essentially parallel arrangement of conductive elements with respect to its position also located internally within the pre-determined layered PCB or similar electronic circuitry. Connection of the joined common conductive and enveloping multiple common shield pathways with a common centrally located common conductive pathway 804 that will be to external extension elements will be interposed in such a multiple parallel manner that said elements will have microns of distance separation or 'loop area' with respect to the complimentary, phased differential electrodes that are sandwiched

569 themselves and yet are separated from the extension by a distance containing a dielectric
570 medium. This enables the extension to become an enveloping shield-like element that will
571 perform electrostatic shielding functions, among others, that the energized combination will
572 enhance and produce efficient, simultaneous conditioning upon the energy propagating on or
573 along said portions of assembly differential conductors. The internal and external parallel
574 arrangement groupings of a combined common conductive planes or areas will also cancel
575 and/or suppress unwanted parasitics and electromagnetic emissions that can escape from or
576 enter upon portions of said differential conductors used by said portions of energy as it
577 propagates along a conductive pathway to active assembly load(s). In the following sections,
578 reference to common conductive pathway 804 also applies to common conductive pathway
579 808 and 810. Common conductive pathway 804 is offset a distance 814 from the edge of the
580 invention. One or more portions 811 of the common ground common conductive pathway 804
581 extends through material 801 and is attached to common ground termination band or structure
582 802. Although not shown, the common ground termination band 802 electrically connects the
583 common conductive pathways 804, 808 and 810 to each other, and to all other common
584 conductive pathways of the filter, if used.

585 The conductive electrode pathway 809 is not as large as the common conductive
586 pathway 804 such that an offset distance and area 806 exists between the edge 803 of the
587 electrode pathway 809 and of the edge 805 of the central common conductive shared pathway
588 804. This offset distance and area 806 enables the common conductive pathway 804 to
589 extend beyond the electrode pathway 809 to provide a shield against any flux lines which
590 might extend beyond the edge 803 of the electrode pathway 809 resulting in reduction or
591 elimination of near field coupling to other electrode pathways within the filter or to elements
592 external to the filter. The horizontal offset is approximately 0 to 20+ times the vertical distance
593 between the electrode pathway 809 and the common conductive pathway 804, however, the
594 offset distance 806 can be optimized for a particular application but all distances of overlap

595 806 among each respective pathway is ideally approximately the same as manufacturing
596 tolerances will allow. Minor size differences are unimportant in distance/area 806 between
597 pathways as long as the electrostatic shielding function of structure 800" is not compromised.
598 In order to connect electrode 809 to the energy pathways (not shown), the electrode 809 may
599 have one or two portions 812 which extend beyond the edge 805 of the common conductive
600 pathway 804 and 808. These portions 812 are connected to electrode termination band 807
601 which enables the electrode 809 to be electrically connected to the energy pathways (not
602 shown) by solder or the like. It should be noted that element 813 is a dynamic representation
603 of the center axis point of the three-dimensional energy conditioning functions that take place
604 within the invention and is relative with respect to the final size, shape and position of the
605 embodiment in an energized circuit.

606 Referring now to Fig. 2, the concept of the universal, multi-functional, common conductive
607 shield structure (UMFCCSS) is shown. The UMFCCSS shown comprises multiple, stacked,
608 common conductive cage-like structures 800A, 800B, 800C, and 800D (each referred to
609 generally as 800X), in a generally parallel relationship. Each common conductive cage like
610 structure 800X comprises at least two common conductive pathway electrodes 830, 810, 804,
611 808, 840. The number of stacked, common conductive cage-like structures 800X is not limited
612 to the number shown herein, and can be any even integer. Although not shown, in
613 applications, each common conductive cage-like structure sandwiches a conductive pathway
614 electrode as previously described in relation to Fig. 1. The common conductive cage-like
615 structure 800X are shown separately to emphasize the fact that any type of conductive
616 pathway electrode can be inserted within the common conductive cage like structures 800X.
617 As such, the common conductive cage-like structures 800X have a universal application and
618 can be used in combination with conductive pathway electrodes in discrete, or non-discrete
619 configurations such as, but not limited to, embedded within silicone or as part of a PCB. The
620 common conductive pathway electrodes 830, 810, 804, 808, 840, have terminations which are

all conductively interconnected as shown at 802 which provide a connection point to an external conductive area. Each common conductive pathway electrode 830, 810, 804, 808, 840, is formed on a plate of dielectric material 801 and insulated on opposite sides by insulation band 805 which is also comprised of dielectric material 801. As has described in Fig. 1, the dielectric material 801, conductively separates the individual common conductive pathway electrodes from the conductive pathway electrodes (not shown) sandwiched therein. Also as described in relation to Fig. 1, a minimum of two Faraday cages 800 and 800' are required to make up a multi-functional line-conditioning device in all of the layered embodiments of the present invention. Accordingly, there are a minimum of two required common conductive cage like structures 800X, as represented in Fig. 2 by 900 A, 900 B, and 900C. The area of convergence (AOC) is designated at 813 and will be discussed in detail below.

Referring now to FIG. 2B, the universal, multi-functional, common conductive shield structure (UFMCCSS) is shown combined with differential conductive energy pathways 4880 C, 4890 C operating within the structure, to form a universal, multi-functional, common conductive shield structure bypass UFMCCSS-B configuration, attached and energized, within a larger external circuitry system (not shown) by solder, or the like, as generally designated at 6805. The field motion as energy is undergoing conditioning within the structure is depicted between differential conductive energy pathways 4880C, 4890C, and each surrounding common conductive cage like structure 800A, 800B, 800C, 800D.

The energy propagating along the differential conductive energy pathways 4880C and 4890C are propagating in opposite directions in relation to each other. Propagation of energy creates inductive coupling in the form of magnetic field fields, shown generally by element 875, which rotate in a counter-clockwise in relation to the energy propagation direction. The opposing direction of energy propagation in differential conductive energy pathways 4880C

647 and 4890C result in the magnetic fields 875 created by the currents rotating in opposite
648 directions providing a mutual flux cancellation, or minimization, of the magnetic fields.

649 While the common conductive cage-like structures structures 800A, 800B, 800C, 800D
650 sandwich the differential conductive energy pathways 4880C, 4890C, the shared, common
651 conductive pathways shared between the structures 800A, 800B, 800C, 800D, provide a
652 voltage balance to the attached circuit. It is noted that the upper and lower most differential
653 conductive energy pathway does not have a corresponding differential conductive energy
654 pathway on the side opposite the area of convergence. The conductively attached common
655 conductive cage-like structures 800A, 800B, 800C, 800D, in combination with common
656 conductive terminations structure 802, sandwich and almost completely envelope differential
657 conductive energy pathways 4880C, 4890C. Specifically, the conductively connected
658 cage like structures provide a double development in conjunction with common conductive
659 terminations structure 802 which helps improve the voltage balance as well as containment of
660 parasitics.

661 Referring now to FIGS. 3A and 3B, a further embodiment of the layered, universal,
662 multi-functional common conductive shield structure of the present invention is shown
663 in a by-pass configuration 6800, hereinafter referred to as "by-pass shield structure "
664 By-pass shield structure 6800 could also take on a configuration of "feed-thru shield
665 structure" 6800 in terms of relative stacking position of a static embodiment of each.
666 There would be relatively no difference between these two possible configurations
667 when inspecting the positioning of stacked two common conductive shield structures
668 1000A and 1000B or of common conductive pathways 6808, 6804, 6810, 6811, 6812 and
669 central common shared conductive pathway 6804 that could make up each
670 embodiment. While appearing physically similar in arrangement "feed-thru shield
671 structure" 6800 and "by-pass shield structure" 6800, each would still yield the same
672 possible functional contribution to the energy conditioning of a circuit. However, the

673 way to which the non-common pathways 6809 and 6807 are positioned would
674 determine the finale type of energy conditioning results that could be expected.
675 Whatever configuration, the various shielding functions, physical and electrically would
676 approximately work the same way with respect to propagated energy in the AOC of 6800
677 Feed-thru or By-pass. Referring specifically to FIG. 3A, the by-pass shield structure
678 6800 is shown in cross section extending longitudinally and comprises a seven layer
679 common conductive pathway stacking of two common conductive shield structures,
680 which form the present embodiment of the by-pass shield structure. In FIG.3B, the by-
681 pass shield structure 6800 is shown in cross section perpendicular to the cross section
682 shown in FIG. 3A.

683 Referring to both FIGS. 3A and 3B, the by-pass shield structure 6800 comprises a
684 central common conductive shared pathway 6804 that is connected with elements and
685 energized and will form a zero voltage reference to circuitry (not shown) with the
686 creation of 6804-IM, 6811-IM and 6812-IM which is formed and relative only to the active
687 circuit elements attached commonly (not shown) but not before connection of the 6802
688 (s) by connection means 6805 to external conductive surface 6803. After energization
689 the energized circuit (not shown) created active energy-utilizing load or loads will utilize
690 portions of propagated energy with elements, central common conductive shared
691 pathway 6804, 6808, 6810, 6811, 6812 which are all attached to external common
692 conductive electrode structure(s) 6802 which in turn are both coupled to external
693 common conductive pathway 6803 by attachment means 6805 such as solder material
694 or any other attachment means commonly found in the art. With energization, the
695 circuitry will include a passively operating universal, multi-functional, common
696 conductive shield structure that will be used by energy source and energy-utilizing load
697 (s) with propagated energy in a balanced manner that will be available when energized
698 active components in said circuitry (not shown) demand portions of said energy.

699 Elements as just described including portions of all of the common conductive
700 elements in the chain of connections to 6803 as just described will be have created for
701 said energized circuit elements, a zero voltage reference 6811-IM, 6804-IM, 6812-IM
702 respectively, and with central common conductive shared pathway 6804 electrically
703 balance coupled energy within the circuit with the formation of a third but common
704 electrical node, separate of the two distinct and separate differential nodes utilized by
705 differential conductive pathways 6809 and 6807 and their respective conductively
706 linking elements.

707 In order to couple by-pass shield structure 6800 to an energized circuit,
708 differential conductive pathways 6807 and 6809, respectively, are each inserted into one
709 of the two common conductive shield structures. The first common conductive shield
710 structure is formed between common conductive pathway 6810 and central common
711 conductive shared pathway 6804. The second common conductive shield structure is
712 formed between common conductive pathway 6808 and central common conductive-
713 shared pathway 6804. To use by-pass shield structure 6800 a first differential
714 conductive pathway 6807 is placed within the first common conductive shield structure
715 and separated from the common conductive pathway 6810 and the central common
716 conductive-shared pathway 6804 by a dielectric material 6801. The dielectric material
717 6801 separates and electrically isolates the first differential conductive pathway 6807
718 from the first common conductive shield structure. In addition, a second differential
719 conductive pathway 6809 is placed within the second common conductive shield
720 structure and separated from the common conductive pathway 6808 and the central
721 common conductive-shared pathway 6804 by a dielectric material 6801.

722 The first and second differential conductive pathways 6807 and 6809,
723 respectively, are then electrically connected to external conductive energy pathways
724 6820 and 6821, respectively. The electrical connections can be made by any means

725 known to a person of ordinary skill in the art, including but not limited to solder,
726 resistive fit sockets, and conductive adhesives. Completing the by-pass shield
727 structure 6800 are the additional outer shield structures 6811 and 6812, which sandwich
728 both common conductive shield structures with dielectric material 6801 interposed
729 between. Each of the outer common conductive shields form image structures 6808-IM
730 and 6810-IM as just described, when energized, that includes an outer conductive
731 portion of shields 6811 and 6812 (not shown) and the outer conductive portions of
732 external common conductive electrode structure(s) 6802 that forms a relatively large
733 skin area and a zero voltage reference with 6804-IM by external common conductive
734 electrode structure 6802. The outer skin surface formed by the combination of the
735 external common conductive electrode structure 6802 and the outer shield image
736 structures 6811 and 6812 absorbs energy when the circuit is energized and than act as
737 an additional enveloping shield structure with respect to 6809 and 6807 differential
738 conductive pathways. If the by-pass shield structure 6800 is attached to an external
739 common conductive pathway 6803 of an energy conditioning circuit assembly ("ECCA")
740 by known means, such as solder material 6805, portions of energy will travel along the
741 created low impedance pathway that exists internally with common conductive
742 structure elements and the external connection to third conductive pathway 6803 and
743 be able to return by this pathway to its source.

744 The external common conductive electrode structure(s) 6802 are connected to
745 electrical circuits by means known in the art and therefore the present invention is not
746 limited to discreet structures but could, for example, be formed in silicon within an
747 integrated circuit. In operation, by-pass shield structure 6800 and the two common
748 conductive shield structures (referred elsewhere in the application as contained
749 structures 800C and 800D, effectively enlarge the zero voltage reference 6804-IM, 6811-
750 IM and 6812-IM within the area of convergence ("AOC") 6813. The AOC 6813 is the

751 energy central balance point of the circuit. No matter the amount of shield layers
752 used, the very basic common conductive pathway manufacturing sequence (excluding
753 dielectric materials, etc.) is as follows, always, first a common conductive pathway, then
754 a conductive pathway, then a second common conductive pathway, second conductive
755 pathway and a third common conductive pathway. Additional sequence would than be
756 as follows, third conductive pathway, fourth common conductive pathway, fourth
757 conductive pathway; fifth common conductive pathway. If a shield configuration is
758 desired to be used like 6800 by-pass or feed through, no difference, last sandwiching
759 common conductive pathways 6811 and 6812 are placed in the manufacturing sequence
760 as follows: (excluding dielectric material, etc.) 6812, common conductive pathway, than
761 conductive pathway, than common conductive pathway, than second conductive
762 pathway, then common conductive pathway, than third conductive pathway, than
763 common conductive pathway, than fourth conductive pathway, than common
764 conductive pathway and finally 6811.

765 The result of the by-pass shield structure when energized within a circuit is
766 increased physical shielding from externally generated and internally propagating
767 parasitics 6816 (represented by the double sided arrows) as well as providing lower
768 impedance paths generated along the common conductive pathway electrode surfaces
769 to external conductive pathway 6803. The double-sided arrows depict the electrostatic
770 functions that occur in an energized state to energy parasitics 6816, which are also
771 representative of portions of externally and internally originating energy parasitics that
772 would otherwise disrupt portion of propagated energy. The double-sided arrows show
773 the charged electron exchange representative of the electrostatic functions that occur
774 in an energized state to trap parasitics within a shielded container. The double-sided
775 arrows also represent the simultaneous, but opposite charge affect that occurs along
776 the "skins" of the conductive material that is located within each respective container.

777 Referring now to FIG. 4A and 4B, a universal, multi-functional, common
778 conductive shield structure with feed-thru pathways (UMFCCSS-F) is described. Fig. 4A
779 shows the universal, multi-functional, common conductive shield structure having four stacked,
780 common conductive cage-like structure containers 800A, 800B, 800C, and 800D (each
781 referred to generally as 800X), in a generally parallel relationship, as previously shown in FIG.
782 2. Each common conductive cage like structure 800X comprises at least two common
783 conductive pathway electrodes 4830, 4810, 4804, 4808, 4840. The common conductive
784 pathway electrodes 4830, 4810, 4804, 4808, 4840, each have terminations which are all
785 conductively interconnected as shown at 802 which provides a connection point to an external
786 conductive area (not shown). Turning to FIG. 4B, four stacked, common conductive cage-like
787 structure containers 800A, 800B, 800C, and 800D each contain a conductive pathway
788 electrode 4809A, 4807A, 4809B, and 4807B, respectively. The conductive pathway electrodes
789 4809A, 4809B are conductively connected in parallel by termination bands 4880A and 4880B
790 through the universal, multi-functional, common conductive shield structure in a feed-thru
791 relationship. Termination bands 4880A and 4880B are conductively connected to power
792 energy pathways from an energy power source (not shown). Termination bands 4890A and
793 4890 B. are conductively connected to return energy pathways from to an energy-utilizing load.
794 It can be seen from Fig. 4B that the power conductive pathway electrodes 4809A and 4809B
795 are interspersed with return conductive pathway electrodes 4807A and 4807B. Relating back
796 to Fig. 4A, it can be seen that the shared common conductive pathway electrodes 4810, 4804,
797 4808 between common conductive cage like structure containers 800A, 800B, 800C, and 800
798 D, are each sandwiched in Fig. 4B between a power conductive pathway electrode and a
799 return conductive pathway electrode. This enables the universal, multi-functional, common
800 conductive shield structure to operate in a balanced manner as will be described in detail in
801 relation to Fig. 5B. It is also pointed out that the central common conductive shared pathway
802 electrode 4804 is centrally positioned having one power conductive pathway electrode and one

803 return conductive pathway electrode on each side. Therefore, central common conductive
804 shared pathway electrode 4804 not only provides a balance between adjacent conductive
805 pathway electrodes 4807A, 4809B, but also between call conductive pathway electrodes as
806 the center of the area of convergence 813.

807 Referring now to FIG. 4C and 4D, a universal, multi-functional, common conductive
808 shield structure with feed-thru pathways (UMFCCSS-F) is described. Fig. 4C again shows the
809 universal, multi-functional, common conductive shield structure having four stacked, common
810 conductive cage-like structure containers 800A, 800B, 800C, and 800D (each referred
811 generally as 800X), in a generally parallel relationship, as previously shown in FIG. 2. Each
812 common conductive cage like structure 800X comprises at least two common conductive
813 pathway electrodes 4830, 4810, 4804, 4808, 4840. The common conductive pathway
814 electrodes 4830, 4810, 4804, 4808, 4840, each have terminations which are all conductively
815 interconnected as shown at 802 which provides a connection point to an external conductive
816 area (not shown). Turning to FIG. 4D, four stacked, common conductive cage-like structure
817 containers 800A, 800B, 800C, and 800D each contain a conductive pathway electrode 4809C,
818 4807C, 4809D, and 4807D, respectively. The conductive pathway electrodes 4809C, 4809D
819 are conductively connected in parallel by termination band 4880C through the universal, multi-
820 functional, common conductive shield structure in a by-pass relationship. Termination band
821 4880C is conductively connected to a power energy pathway from an energy power source
822 (not shown). Termination band 4890C is conductively connected to a return energy pathway
823 from to an energy-utilizing load (not shown). It can be seen from Fig. 4D that the power
824 conductive pathway electrodes 4809C and 4809D are interspersed with return conductive
825 pathway electrodes 4807C and 4807D. Relating back to Fig. 4C, it can be seen that the
826 shared common conductive pathway electrodes 4810, 4804, 4808 between common
827 conductive cage like structure containers 800A, 800B, 800C, and 800D, are each sandwiched
828 in Fig. 4D between a power conductive pathway electrode and a return conductive pathway

829 electrode. This enables the universal, multi- functional, common conductive shield
830 structure to operate in a balanced manner as will be described in detail in relation to Fig. 5B.
831 Again, it is also pointed out that the central common conductive shared pathway electrode
832 4804 is centrally positioned having one power conductive pathway electrode and one return
833 conductive pathway electrode on each side. Therefore, central common conductive shared
834 pathway electrode 4804 not only provides a balance between adjacent conductive pathway
835 electrodes 4807C, 4809D, but also between call conductive pathway electrodes as the center
836 of the area of convergence 813.

837 Turning to FIG. 5A & FIG. 5B which are almost identical depictions of UM FCCSS 3800-
838 BY-PASS, and both will be described freely, back and fourth to explain and reveal a simple
839 circuit using the invention and how portions of energy propagates within the circuit depicted in-
840 terms of the other invention elements that will be listed. FIG. 5A is more of UM FCCSS 3800-
841 BY-PASS a system view, while FIG. 5B is a close-up of the system energy propagation effects
842 and structural representations of UM FCCSS 3800-BY-PASS as portions of energy is
843 undergoing conditioning within the AOC of the invention embodiment. FIG. 5B depicts or
844 represents a moment in time or snap-shot of an exploded and inside-out view or depiction of a
845 minimally configured 5-conductive pathway electrode layering within a UM FCCSS 3800 (in-By-
846 Pass) placed into a simple circuit arrangement and energized with propagating energy EEE-
847 portions of propagating Energy; elements include 000 the circuit system 00 – energy source for
848 the system and EEE for the energy-utilizing load 01 – energy-utilizing load of the system. The
849 UM FCCSS-Bypass 3800 embodiment of the invention and a depiction of a snapshot of line
850 conditioning functions for portions of energy propagation EEE that is underway within system
851 000. Dielectric material 3801 generally supports and insulates the conductive layers from
852 each other as previously described in other embodiments. The electrostatic charge switching
853 exchange 3802 or or a portion of the E-Field suppression of parasitic energies from 3818 and
854 3804 conductor cancellation of energy of UM FCCSS-B is also shown. Conductive pathway

855 material 3803 for attachment means differential conductive pathway or
856 electrode 3804. Element 3805 (Not Shown) but is conductive mounting pad surface (needed)
857 or area or means for portions of energy propagated along differential conductive attachment
858 between 3818 to 3815 VIA 3809, if needed to 3820 from load 00 and to source 01 and from
859 3804 to 3803 to 3809 to 3811 from source 01 to load 00 and to 3818 thru 3809 (Not Shown).

860 Element 3806 represents common conductive pathway or electrode while element 3808
861 is the external common conductive pathway or area for portion of propagated energy to move
862 to after passing into the AOC and utilizing common conductive pathway elements (
863 described) when portions of energy propagate to source 00, if able and will also work as a low
864 impedance area or said energy EEE to return to source 00, if able.

865 Element 3809 represents a conductive VIA

866 3811 external differential conductive pathway

867 3813 AOC

868 3815 conductive pathway material for attachment means for external differential
869 conductive pathway 3818 and

870 external differential conductive pathway 3804

871 3816 Central common conductive shared pathway or electrode

872 3817 Central commonly shared "0" Voltage reference plane

873 3818 differential conductive pathway or electrode

874 3819 common conductive pathway or electrode

875 3820 external differential conductive pathway

876 3821A is a conductive material means for the connection of all the common conductive
877 pathways 3806, 3816, 3819 and commonly shared "0" Voltage reference plane 3817

878 3821B is also a conductive material means like 3821A for the connection to the same
879 group of common conductive pathways 3806, 3816, 3819 and commonly shared "0" Voltage
880 reference plane 3817

881 3824 Mutual Inductive Cancellation Portion or H-Field cancellation of
882 energy of UM FCCSS-B shown

883

884 The UM FCCSS-3800-BY-PASS is described as a minimum unit in which a capacitance
885 is formed by the pair of the inner conductive pathway electrodes 3818 and 3804 separated by
886 a respective dielectric layer or material 3801 and by central shared common conductive shield
887 pathway electrode 3816. The described grouping as a whole is now further described as being
888 sandwiched or almost enveloped by outer common conductive pathway electrodes 3806 and
889 3819. This is the total minimum Universal multi-functional common conductive shield structure
890 with by-pass pathways sandwich of layers always includes, which is a plurality of dielectric
891 layers or material 3801 always located or adjacent to some degree against almost all sides of
892 all of the respective principle energy (NOT SHOWN) propagating surfaces of conductive
893 pathway electrode elements, which are as follows:

894 EEE – portions of propagating Energy (not shown)

895 000 System

896 00 – energy source for the system and the energy-utilizing load

897 01 – energy-utilizing load of the system

898 3801 Dielectric material

899 3802 Electrostatic charge switching exchange or or a portion of the E-Field suppression
900 of parasitic energies from 3818 and 3804 conductor cancellation of energy of UM FCCSS-B
901 shown in FIG 5A

902 3803 conductive pathway material for attachment means

903 3804 differential conductive pathway or electrode

904 3805 is conductive mounting pad surface (as needed) or area or means for portions of
905 energy propagated along differential conductive attachment between 3818 to 3815 to VIA
906 3809, (if needed) to differential pathway 3820 located between 00 and to 01 and than on the

36

907 opposite side is differebtial conductive mounting pad 3805 (if needed) conductive
908 pathway flow is from 3804 to 3803 to 3805 (if needed) 3809 to differential pathway 3811
909 located beteen source 00 and energy-utilizing load 00.

910 3806 is a common conductive pathway or electrode

911 3808 is the external common conductive pathway or area for portion of propagated
912 energy to move to after passing into the AOC and utilizing common conductive pathway
913 elements as described when portions of energy propagate to source 00, if able and will allow
914 additional also work as a low impedance area or said energy EEE to return to source 00. "f
915 able.

916 3809 is a conductive VIA

917 3811 is a external differential conductive pathway

918 3813 is a AOC

919 3815 is a conductive pathway material for attachment means for external differential
920 conductive pathway 3818 and external differential conductive pathway 3804 and 3816 Central
921 common conductive shared pathway or electrode

922 3817 is a Central commonly shared "0" Voltage reference plane

923 3818 is a differential conductive pathway or electrode

924 3819 is a common conductive pathway or electrode

925 3820 is a external differential conductive pathway

926 3821A is a conductive material means for the connection of all the common conductive
927 pathways 3806,3816, 3819 and forms commonly shared "0" Voltage reference plane 3817

928 3821B is also a conductive material means like 3821A for the connection to the same
929 group of common conductive pathways 3806,3816, 3819 and commonly shared "0" Voltage
930 reference plane 3817. 3824 is a Mutual Inductive Cancellation Portion or H-Field cancellation
931 of energy of UMFCCSS-B shown. The parallel layering starts with one central shared common
932 conductive shield pathway 3816, then working outward from both directions with respect to

37

933 large conductive surfaces on either side of 3816, dielectric material 3801, respective
934 conductive pathways 3818 and/or 3804, dielectric material 3801, and respective outer common
935 conductive pathways 3819 and 3806 followed by material 3801. No matter what layering
936 sequence is used in manufacturing the invention, the minimum resulting embodiment for either
937 UM FCCSS-3800-BY-PASS or UM FCCSS-FEED-THRU should have this resulting sequence.

938 Referring to FIG5B which represents the charged electron exchange that serves as a
939 descriptive representation of the electrostatic functions that occur in an energized state to trap
940 parasitics within a shielded container This also is representative of the simultaneous, but
941 opposite charge affect that is occurring along the "skins" of the conductive material that is
942 located with in each respective "container" on opposite sides of the central common and
943 shared conductive pathway 3816. Large conductive arrears located on both the respective
944 sides of 3816 and on one of two large conductive areas of common electrodes 3819 and 3806
945 that face the respective large areas of conductive material located on each large side of
946 electrode 3816. Energy propagated upon 3818 and 3804 is condition simultaneously in this
947 local in any invention embodiment regardless of the number of conductive containers that are
948 stacked, regardless if multiple conductive pathways are contained such as additional paired
949 plates 3818A and 3804A (NOT Shown) that are arranges in a manner which consists of a
950 plurality of additional differential and paired pathway electrodes interleaved and embedded
951 within a dielectric casing with paired group of differentially operating conductive pathways as a
952 closely spaced pair of conductive elements which significantly increase the total area of paired
953 groups of differentially operating conductive pathways a correspondingly increase in the
954 current handling capacity of the full embodiment will occur. While this disclosure serves well in
955 a UM FCCSS-FEED-THRU USAGE WHERE 3804, 3818 and companion electrodes 3804A,
956 3818B (not shown) would benefit, in all cases any UM FCCSS-FEED-THRU embodiment will
957 always have electrical current limitations due to the energy flowing through the AOC rather
958 than moving in a by-pass fashion in which all conductively layered electrodes or pathways are

959 being utilized by portions of propagated energy located on opposite sides of the
960 critical centrally positioned common conductive pathway electrode and "0" voltage reference
961 plane. Electrically in parallel means that when attached as disclosed in a manner as revealed
962 herein. An electrically parallel fashion means with respect to the conductive energy pathways
963 utilized by energy propagated from an operating source propagated to the AOC, propagating
964 further to the energy-utilizing source and then, portions of energy are propagated from the
965 energy-utilizing load to the AOC and than portions returning by way of the AOC to source
966 pathways or portions are taken off through the low impedance pathway enhanced by the third
967 conductive set of pathways that are common within the AOC and to one another that leads to
968 the externally positioned common conductive external pathways. As described a properly
969 attached invention whether discrete or non-discrete will aid in achieving a simultaneous ability
970 to perform multiple and distinct energy conditioning functions such as decoupling, filtering,
971 voltage balancing using parallel electrical positioning principals which are always relative to the
972 energy source, paired conductive energy pathways, the energy utilizing load and the
973 conductive energy pathways returning back to the source to complete the circuit. This also
974 includes the opposing but electrically canceling and complimentary positioning of portions of
975 propagated energy acting upon the conductive pathways in a balanced manner on opposite
976 sides of a "0" Voltage reference created simultaneously using the pivotal centrally positioned
977 common and shared conductive electrode pathway. This generally always-parallel energy
978 distribution scheme allows the material make up of all of the manufactured invention elements
979 to operate together more effectively and efficiently with the load and the source pathways
980 located within a circuit. By operating in a balanced manner material stress is significantly
981 reduced as compared to the prior art. Thus phenomena such as elastic material "memory or
982 hysteresis effect is minimized. Piezoelectric effect is also substantially minimized, thus energy
983 is not detoured or inefficiently utilized internally within the AOC and is automatically available
984 for use by the load in a largely dramatic increase in the ability of standard and common

985 dielectric materials to perform functions within the AOC and the circuitry in a broader, less
986 restrictive use, thus reducing costs while allowing performance levels above that of prior art.
987 Testing has confirmed that invention embodiments made in tantalum material can be
988 eliminated as well as the inductive elements needed for their support. This benefit is due
989 primarily to a combination of factors that have occurred statically and during energization into
990 circuitry. from a static state, the manufacturing of discrete variations of the invention can be
991 done with standard industry manufacturing methodologies and equipment use now. standard
992 and common conductive materials and dielectric materials can be utilized to replace more
993 exotic materials used in prior art to enhance effectiveness. in an energized state minimization
994 of both hysteresis and piezoelectric effects upon dielectric and conductive material stresses
995 within the aoc of the invention translates or equals an increase performance levels for such
996 applications as SSO states, decoupling power systems, quicker utilization of the passive
997 component by the active componentry is also achieved directly attributed to these stress
998 reductions and the balanced manner in which propagated energy is allowed to utilize the
999 UM FCCSS. the reduction standard x7r materials can static on, a better and more effect
1000 solution for both Bypass, thru-feed-thru and the energy conditioning that takes place between
1001 the 3818 and 3804 electrode pathways. central shared common conductive shield pathway
1002 electrode 3816 is the balancing point for energy originating (with respect to itself) on the
1003 generally parallel and opposite sides of 3816, within the structure and will have located in close
1004 proximity with respect of the entire 3800 physical 3-dimensional center, a center point of
1005 energy conditioning, suppression and shielding. before energization, free electrons are
1006 distributed randomly on the outer "skin" of all the conductive pathways all the plates are GND
1007 are in parallel respectively to each other but are lower cap value series to board

1008 Now turning to FIG. 5C and FIG. 5D, Moving freely between FIGS. 5A, 5B, 5C and 5D, a
1009 disclosure of portions of the AOC circuitry functions of any UM FCCSS in a possible bypass
1010 arrangement are shown. FIG. 5C is the graphed response of two 3800 (in-bypass) configured

1011 capacitive-type units constructed relative to the related invention elements FIG 5C shows
1012 a test data comparing two universal multi-functional common conductive shield structures with
1013 bypass pathways (UMFCCSS-B) 3800-A and 3800B that have been made into a 1206 size
1014 package which is a standard package size used by the passive component manufacturing
1015 industry for sale of embodiments as a discrete passive component, whether capacitive or
1016 inductive the term 1206 is universally understood by those of the art. Embodiments 3800-A
1017 and 3800-B are roughly of the same capacitive values. 3800-A and 3800B do not differ
1018 significantly in terms of the placement arraignment of any of the conductive pathway
1019 electrodes with respect to the common conductive pathway electrodes within. 3800-A and
1020 3800B do not differ significantly with any of the solder material used to physically make the
1021 connection. 3800-A and 3800B do not differ significantly in terms of the placement arraignment
1022 of any of the common conductive pathway electrodes within, nor differ significantly between
1023 the respective conductive terminations structures that are used to connect 3800-A and 3800B
1024 into the test circuit.

1025 3800-A and 3800B do differ slightly in the static capacitive value but both differ very
1026 significantly by dielectric material used in each units manufacturing process. 3800-A is made
1027 with a MOV dielectric with a Mean Average value of Line to Ground capacitance of approx.
1028 912 pF while 3800-B is made with the X7R dielectric with an average lot value of Line to
1029 Ground capacitance of approx. 1,000 pF.

1030 3800-A and 3800-B are attached into Test setup circuit similar in function to system
1031 3829 shown in FIG. 5A. FIG. 5C shows the graphed test results as lines 3800-A1, 3800-B1.
1032 While capacitor values of 3800-A and 3800-B are similar, the dielectric material is not and yet
1033 the test results shown that the more expensive and not as commonly used MOV material takes
1034 on a stunning filter effectiveness of the more common X7R material. These test results 3800-
1035 A1 and 3800-B1 show that a user of the invention configured like 3800-A will be able to utilize
1036 all of the beneficially desired MOV dielectric characteristics of quick clamping of voltage

transients and surge suppression capabilities that this particular dielectric is known for in the art. What is unexpected is the apparent unending breadth of the frequency insertion loss response that is shown and obtained with 3800-A using MOV material. Across the frequency spectrum the trend line shows an almost purely capacitive reaction to propagated energy is shown as depicted in the graph line to 1,200 MHz. It should be noted that 1,200 MHz was the limit of the test equipment used. Trend Lines 3801A-TX7R and 3801-TMOV enhance the almost capacitive response out to the known limit of the test equipment. Surge testing of X7R in the converse fashion, against a like value MOV and X7R configuration, respectively of 3801-A and 3801-B shows an unexpected ability of X7R dielectric to also react with quick-like MOV transient response characteristics for common mode transients that occur in an energized circuit state. Thus, all embodiments and variations of the invention similarly constructed or manufactured by standard means and used with standard, multiple, paired line circuit situations and having a dielectric difference as the only significant variation between identically configured invention embodiments will yield an insertion loss performance measurement in a manner that is unexpected and unobvious considering the respective known dielectric material response of prior art. This comparison of like invention units (other than of dielectric material) clearly and unequivocally reveals the primary reason or factor causing this result and circuit performance is new common conductive shield structure and external conductive attachment elements working in combination in a Gauss-Faraday cage-like fashion using electrostatic suppression, physical shielding and for influencing the conditioning of energy propagated within the circuit system said invention is incorporated into. Thus, discrete and/or non-discrete embodiments using a common conductive shield structure and external conductive attachment elements as disclosed or contemplated and using dielectrics that have been categorized primarily for a certain electrical conditioning function or results will find that usage with the invention elements so arranged herein or inventions constructed with element equivalents will achieve unexpected and beneficial characteristics added to the

1063 previously limited usage knowledge of the dielectric material used. This includes any
1064 possible layered application that uses non-discreet capacitive or inductive structures that can
1065 incorporate a variation of the invention within a manufactured discrete silicon die and the like,
1066 for example or a super capacitor application or even an atomic level energy conditioning
1067 structure.

1068 FIG. 5D is a data graph comparing various attachments connections and non-
1069 attachments non-connections of common conductive termination structures of a universal
1070 multi-functional common conductive shield structure with bypass pathways (UMFCCSS-B) that
1071 are conductively connected to all common conductive pathway electrodes and an external
1072 conductive surface common to all termination structures run out to 500 MhZ in the test circuit
1073 system connected in a similar manner to that shown in FIG. 5A and FIG. 5B. Conductive
1074 pathway electrodes 3815 (A) and 3803 (B) of the same invention embodiment are measured in
1075 relation to four sequential stages of attachment to a common conductive pathway separate of
1076 conductive pathway electrodes 3815 (A) and 3803 (B) and externally located (with respect of
1077 the AOC). This common conductive pathway extends upward and into the AOC by means of
1078 the conductive connection such as 3821A and 3821B that facilitates the low impedance
1079 characteristics of the internal conductive pathway electrodes that are created by mutual
1080 cancellation of opposing magnetic flux found occurring within an energized, manufactured
1081 invention when properly placed into circuitry. These sequential stages of attachment were
1082 tested and the results are labeled 3800-1,2,3,4 respectively and are normalized for Insertion
1083 loss. Package size utilized is a 1206 Sized layering with a static capacitance rating of 220pF,
1084 Line to Ground constructed in NPO dielectric material. Plot 3800-1 is of attachment to
1085 conductive electrode pathway elements 3815 and 3803, ONLY. This test run shows little effect
1086 to the energy propagated within the AOC of the invention, however, it is disclosed as shown in
1087 FIG. 5A and FIG. 5B that additionally placed common conductive pathways those marked (#-
1088 IM) are common conductive electrode pathways commonly attached with the inherent central,

1089 shared image "0" voltage reference plane will increase the shielding effectiveness of the
1090 invention in many ways. These are additionally placed common conductive pathways located
1091 outside the essential groupings of paired conductive shield-like containers and which will again
1092 aid to some degree in effecting the energy propagation relative to externally attached common
1093 conductive areas. Plot 3800-2 is of attachment to conductive electrode pathway elements 3815
1094 and 3803, and attachment of BOTH 3821A and 3821B to an externally located common
1095 conductive carrier ground. When test is performed on 3800-2, only a connection to 3821A is
1096 made to common external conductive path and over 46 dB of attenuation with a resonant
1097 frequency of 300 MHz is seen. In this configuration the Invention is not really working as
1098 UM FCCSS because while the common conductive pathway electrodes within the component
1099 are indeed physically in parallel with respect to one another, they are considered actually in
1100 series to the external conductive common pathway that is part of the main circuit return or
1101 ground. This configuration 3800-2 also shows that the differential pathways are in series
1102 conductively with the energy-utilizing load and the energy return pathways of the circuit,
1103 despite 3 of 4 terminals connected. The shared common conductive centrally located pathway
1104 also becomes un-important and the same as any of the other common plates located within
1105 the AOC with respect of the energy conditioning that is taking place. With the series
1106 relationship in place for the circuit, common plates are indeed common so much so that a "0"
1107 Voltage Image reference function is not achieved, full cancellation of mutual inductance and
1108 full electrostatic switching, essential for full parasitic suppression, is not achieved. Once the
1109 configuration hits resonance, inductive properties of the invention overwhelm capacitance and
1110 prior art performance appears. Thus, the critical nature of the full attachment of all exiting
1111 common conductive electrode pathways located or accessible to an external conductive
1112 pathway attachment is revealed as very critical in achieving a simultaneous ability to perform
1113 multiple and distinct energy conditioning functions such as power and signal decoupling,
1114 filtering, voltage balancing using electrical positioning relative to opposite sides of a "0" Voltage

1115 reference created on opposite sides of the single centrally positioned common and
1116 shared conductive electrode pathway.

1117 As seen when both 3821A and 3821B of the invention are attached to the common
1118 conductive external area all common and conductively attached electrode elements allow
1119 propagated energy to operate electrically parallel with respect to the source and the load as
1120 well as with the other common conductive structures position not only to each other but also
1121 with any main circuit return path, chassis ground or low impedance pathway. In this
1122 configuration, as revealed this attachment method 3800-3 results in measured the invention
1123 resonant frequency moving from 301 MhZ out approximately 86 MHz to 387 MhZ. This would
1124 normally be achieved in the prior art components by the addition of more prior art passive
1125 components of different values to achieve the same an equivalent effect. 3800-3 represents the
1126 performance improvement achieved with an additional external conductive strap wrapped over
1127 the UM FCCSS-B from 3821A TO 3821B and adds an common conductive pathway in parallel
1128 to the internal pathways disclosed and thereby again enhances and lowers the impedance of
1129 the third conductive and common pathway within the AOC to a propagated energy-return path
1130 that can be utilized portions of energy originating from the same source. It should be noted that
1131 although internally the conductive pathways are balanced, that once the invention is placed
1132 upon the common conductive area created by the puddle solder material placed during the test
1133 creates a slight, but unimportant un-balance among the common conductive plates that is
1134 noted as non-critical. The addition of the outer conductive strap from 3821A TO 3821B adds
1135 back the conductive pathway balance and shifts the self-resonate point out almost another 38
1136 MhZ to from 387 MhZ to 425 MhZ . This configuration is mimicked by additional outer, closely
1137 positioned plates 6808-IM and 6810-IM which are placed to enhance a and further shift
1138 outward the unit self resonate point. It should be noted that if the container structures that
1139 make up an invention are in balanced according to the stacking sequence shown, any added
1140 or extra common conductive shield structure that is added by mistake or with forethought will

1141 not sufficiently hamper or degrade energy conditioning operations and actually reveal a
1142 potential cost savings in the manufacturing process wherein automated layer processes could
1143 possibly added the additional outer layer or layers as described. It is disclosed that these
1144 errors intentional or accidental will not detriment ally harm the balance of the invention
1145 containing the properly sequenced stacking of containers as discussed and is fully
1146 contemplated by the applicants.

1147 At least three, distinctly different energy conditioning functions will occur within any
1148 variation of the UMFCSS; electrostatic minimization of energy parasitics by almost total
1149 shield envelopment; physical shielding of differential conductive pathways; electromagnetic
1150 shielding function or mutual magnetic flux cancellation of opposing differential conductive
1151 pathways; use of a "0" voltage reference created by the central, common and shared pathway
1152 electrode that is part of two distinct common conductive shield structures, the parallel
1153 movement shielding effect as opposed to a series movement effect by a majority of the
1154 portions of energy using the AOC in which each energy portion operating on one side of the
1155 central common and shared conductive energy pathway in a electrical and/or magnetic
1156 operation will have a parallel non-reinforcing counterpart that operates in a generally opposing
1157 cancellation-type manner that does not reinforce detrimental forces in a manner like that of the
1158 prior art which operates in a generally series-type manner which may use mutual magnetic flux
1159 cancellation of opposing differential conductive pathway but fails to use the simultaneous
1160 sandwiching electrostatic shielding function as has been described in this disclosure.

1161 Second, in all embodiments whether shown or not, the number of pathways, both
1162 common conductive pathway electrodes and differential conductive pathway electrodes, can
1163 be multiplied in a predetermined manner to create a number of conductive pathway element
1164 combinations a generally physical parallel relationship that also be considered electrically
1165 parallel in relationship with respect to these elements in an energized existence with respect to

1166 a circuit source will exist additionally in parallel which thereby add to create increased
1167 capacitance values.

1168 Third, additional common conductive pathways surrounding the combination of a center
1169 conductive pathway and a plurality of conductive electrodes are employed to provide an
1170 increased inherent ground and optimized Faraday cage-like function and surge dissipation
1171 area in all embodiments.

1172 Fourth, although a minimum of one central common conductive shield paired with two
1173 additionally positioned common conductive pathways or shields are generally desired and
1174 should be positioned on opposite sides of the central common conductive shield (other
1175 elements such as dielectric material and differential conductive electrodes can be located
1176 between these shields as described). Additional common conductive pathways can be
1177 employed with any of the embodiments shown and is fully contemplated by Applicant.

1178 In fact the multi-functional energy conditioner, although not shown, could easily be fabricated
1179 in silicon and directly incorporated into integrated circuits for use in such applications as
1180 communication microprocessor integrated circuitry or chips. Integrated circuits are already
1181 being made having capacitors etched within the silicone foundation which allows the
1182 architecture of the present invention to readily be incorporated with technology available today.

1183 The multi-functional energy conditioner can also be embedded and filter communication
1184 or data lines directly from their circuit board terminal connections, thus reducing circuit board
1185 real estate requirements and further reducing overall circuit size while having simpler
1186 production requirements. Finally, from a review of the numerous embodiments it should be
1187 apparent that the shape, thickness or size may be varied depending on the electrical
1188 characteristics desired or upon the application in which the filter is to be used due to the
1189 physical architecture derived from the arrangement of common conductive electrode pathways
1190 and their attachment structures that form at least one single conductively homogenous faraday
1191 cage-like structure and other conductive electrode pathways.

47

1192 Although the principals, preferred embodiments and preferred operation of the
1193 present invention have been described in detail herein, this is not to be construed as being
1194 limited to the particular illustrative forms disclosed. It will thus become apparent to those
1195 skilled in the art that various modifications of the preferred embodiments herein can be made
1196 without departing from the spirit or scope of the invention as defined by the appended claims

Claims

1. A multi-layered pathway arrangement at least characterized by:
 - two outer shielding, energy pathways;
 - at least one conductive, shielding structure having a first, a second and a third shielding, energy pathway of generally equal size and shape that are conductively coupled to one another;
 - a pair of shielded, energy pathways of generally equal size and shape that includes a first and a second shielded, energy pathway, and wherein the first and the second shielded, energy pathway are conductively isolated from one another;
 - wherein all shielding, energy pathways of the multi-layered pathway arrangement are conductively coupled to one another, and wherein all of the shielding, energy pathways are conductively isolated from the pair of shielded, energy pathways;
 - wherein the pair of shielded, energy pathways is arranged and orientated in a manner that sandwiches the second shielding, energy pathway and shields the pair of shielded, energy pathways from one another;
 - wherein the first shielded, energy pathway is sandwiched by the first and the second shielding, energy pathway, and the second shielded, energy pathway is sandwiched by the second and the third shielding, energy pathway; and
 - wherein the two outer shielding, energy pathways sandwich at least all other shielding, energy pathways of the multi-layered pathway arrangement.
2. The multi-layered pathway arrangement of claim 1, further comprising:
 - a material; and
 - wherein the material is a material having at least certain properties that is selected from a group consisting of a material having at least ferrite properties, a material having at least dielectric properties and a material having at least varistor properties.

3. The multi-layered pathway arrangement of claim 1, wherein the total number of the shielding, energy pathways of the multi-layered pathway arrangement is an odd integer.

4. The multi-layered pathway arrangement of claim 2, wherein pair of shielded, energy pathways are a pair of complementary, by-pass energy pathways that are shielded.

5. The multi-layered pathway arrangement of claim 2, wherein all shielding, energy pathways of the multi-layered pathway arrangement and all shielded, energy pathways of the multi-layered pathway arrangement are comprised of a conductive material.

6. The multi-layered pathway arrangement of claim 4, wherein the total number of the shielding, energy pathways of the multi-layered pathway arrangement is an odd integer.

7. A multi-layered pathway arrangement at least characterized by:
a plurality of shielded pathways of generally equal size and shape having a first and a second shielded pathway which are conductively isolated from each other;

a plurality of shielding pathways of generally equal size and shape which has one shielding pathway that is centrally positioned between an equally divided remainder of the plurality of shielding pathways, and wherein the plurality of shielding pathways are conductively coupled to one another;

wherein the plurality of shielded pathways and the plurality of shielding pathways are comprised of a conductive material;

wherein any one pathway of either the plurality of shielding pathways and the plurality of shielded pathways is spaced away from any other one pathway of either the plurality of shielding pathways and the plurality of shielded pathways;

wherein the first and the second shielded pathway are arranged and orientated in a manner that sandwiches the one shielding pathway of the plurality of shielding pathways from mutually opposite positions;

wherein each shielding pathway of the plurality of shielding pathways is equally larger than any one shielded pathway of the plurality of shielded pathways; and

wherein at least two pairs of shielding pathways of the plurality of shielding pathways sandwich at least all other shielding, energy pathways of the multi-layered pathway arrangement, and the plurality of shielded pathways.

8. The multi-layered pathway arrangement of claim 7, wherein the total number of the plurality of shielded pathways is an even integer.

9. The multi-layered pathway arrangement of claim 8, wherein the total number of the plurality of shielding pathways is an odd integer.

10. The multi-layered pathway arrangement of claim 9, further comprising a material having properties.

11. The multi-layered pathway arrangement as in one of claims 6-9, in which the multi-layered pathway arrangement further comprises;

at least one material having predetermined properties; and

wherein the at least one material having predetermined properties is selected from a group consisting of a material having ferrite properties, a material having semi-insulating properties, a material having insulating properties, a material having dielectric properties, a material having varistor properties, a material having ferro-electric properties, a material having silicon properties, a material having germanium properties, a material having gallium-arsenide properties, and a material having film properties.

12. The multi-layered pathway arrangement as in one of claims 7-10, in which half of the plurality of shielded pathways is conductively isolated and shielded from a remaining half of the plurality of shielded pathways.
13. The multi-layered pathway arrangement as in one of claims 7-10, in which each shielded pathway of the plurality of shielded pathways is always sandwiched by at least two shielding pathways of the plurality of shielding pathways.
14. The multi-layered pathway arrangement as in one of claims 1-10, in which at least a portion of the multi-layered pathway arrangement was made by a doping process.
15. The multi-layered pathway arrangement as in one of claims 1-10, in which the multi-layered pathway arrangement is at least part of a network selected from a group consisting of an energy-conditioning network and a capacitive network.
16. The multi-layered pathway arrangement as in one of claims 1-10, in which the multi-layered pathway arrangement is an arrangement selected from a group consisting of a by-pass multi-layered pathway arrangement and a feed-thru multi-layered pathway arrangement.
17. The multi-layered pathway arrangement as in one of claims 1-10, in which the multi-layered pathway arrangement is coupled to a component selected from a group consisting of a printed circuit boards, an interposer, a substrate, a connector, an integrated circuit, a micro processor unit, and a digital signal processor.

18. The multi-layered pathway arrangement as in one of claims 1-10, in which the multi-layered pathway arrangement prevents escape of shielded energy parasitics from within the multi-layered pathway arrangement.
19. The multi-layered pathway arrangement as in one of claims 1-10, in which portions of the multi-layered pathway arrangement are operable together as a pathway of low impedance for energy portions.
20. The multi-layered pathway arrangement as in one of claims 1-10, in which portions of the multi-layered pathway arrangement are operable for electrostatically shielding energy portions.
21. The multi-layered pathway arrangement as in any of claims 1-10, in which the multi-layered pathway arrangement is operable for at least a first and a second line-to-ground capacitive relationship and at least a first line-to-line capacitive relationship; and
wherein at least a capacitance value of the first or the second line-to-ground capacitive relationship is approximately half of a capacitance value of the first line-to-line capacitance relationship.
22. A conductive pathway arrangement at least characterized by:
a first and a second pathway of common size and shape;
a first conductive shielding structure comprising a first, a second, and a third shielding pathway that are conductively coupled to one another;
two outer shielding pathways;
a material that spaces any one pathway of the conductive pathway arrangement away from any other one pathway of the conductive pathway arrangement;

wherein the first and the second pathway are arranged and orientated in a manner which sandwiches a portion of the first conductive shielding structure from mutually opposite positions, and wherein the first and the second pathway are at least shielded from the one another by the portion of the first conductive shielding structure;

wherein all shielding pathways of the conductive pathway arrangement have common size and shape, and all of the shielding pathways of the conductive pathway arrangement are conductively coupled to one another;

wherein any one of the shielding pathway of the conductive pathway arrangement is larger than the first or the second pathway;

wherein the two outer shielding pathways at least sandwiches the first and the second pathway and the first conductive shielding structure; and

wherein the first and the second pathway are conductively isolated from one another and all of the shielding pathways of the conductive pathway arrangement.

23. The conductive pathway arrangement of claim 22, wherein the material is a material having at least predetermined properties that is selected from a group consisting of a material having at least ferrite properties, a material having at least dielectric properties and a material having at least varistor properties.

24. The conductive pathway arrangement of claim 23, wherein the conductive pathway arrangement is operable as a passive energy conditioning component.

25. The conductive pathway arrangement as in one of claims 22-24, which the conductive pathway arrangement is operable for at least a first and a second line-to-ground capacitive relationship and at least a first line-to-line capacitive relationship;

wherein at least a capacitance value of the first or the second line-to-ground capacitive relationship is approximately half of a capacitance value of the first line-to-line capacitance relationship; and

wherein at least the first conductive shielding structure is operable for electrostatically shielding of energy portions.