

## Patent Portfolio

The patent portfolio is assigned to Innovations Holdings, L.L.C., a New Jersey limited liability company owned by Ewa Herbst.

Patent portfolio includes 11 issued patents and 3 pending patent applications, which can be divided into 6 patent families:

1. Multi-functional electrical stimulation systems and electronic components (stim)
2. Method and apparatus for configurable systems (configurable systems)
3. Electrochemical treatment of tissues, especially tumors (ECT)
4. Treatment of living tissues/Modulation of myosin phosphorylation using electromagnetic fields (EMF)
5. Electronic delivery systems and methods with feedback (delivery)
6. Method and apparatus for diagnosis and treatment (diagn/treatm)

In most cases additional continuation applications or continuation-in-part (CIP) applications are possible, as indicated in each family description.

### Patent Family 1 (stim)

The stimulator patent family includes two patents: US Patent No. [6,029,090](#) entitled “Multi-Functional Electrical Stimulation System” and US Patent No. [6,684,106](#) entitled “Method and Electronic Components for Multi-Functional Electrical Stimulation System”. A currently pending patent application that includes the stimulator subject matter is entitled “High Precision Multi-Output Pulse and/or Signal Generators”. The stimulator patent family encompasses at least two technological areas: medical technologies and semiconductors. Continuation/CIP application is possible.

A flexible and customizable electrical stimulation system can support multiple application areas, including pain management, treatment of motor disorders, gastrointestinal modulation (e.g., for treatment of obesity), treatment of neuropsychiatric and neurodegenerative diseases, cardiac rhythm management, nerve regeneration, bone healing, wound healing, etc. Other applications for signals generated by the system are: electroporation, electrophoresis, application requiring mechanical or acoustic waves by applying signal to appropriate transducer, etc.

Some features of interest are: plurality of outputs, which can be synchronous; plurality of signals available on the outputs; and feedback mechanism for adjusting the output signal depending on one or more simultaneous sensor inputs. The sensors in the system can be physical, chemical, or biochemical/biosensors.

The pending patent application is a CIP of the US Patent No. [6,684,106](#) and adds the EH2000 series of pulse generators, digital electronic components which can be programmed or preset to deliver several simultaneous and synchronous timing parameters. Those electronic components can be used in multiple applications, in addition to electrical stimulation, including: programmable pulse generators, automatic test equipment, biomedical instrumentation, control systems, etc.

### Patent Family 2 (configurable systems)

The configurable systems patent family includes 3 patents: US Patent No. [7,937,683](#); US Patent No. [8,365,122](#); and US Patent No. [8,595,672](#) - all titled "Method and Apparatus for Configurable Systems". A continuation application of US Patent No. [8,595,672](#), also entitled "Method and Apparatus for Configurable Systems", has been filed and has been assigned US Patent Application No. 14/068,792.

The invention relates generally to a flexible analog/digital configuration, the system being preferably on a chip, and used for receiving various inputs, processing them, and being able to display/communicate the results and/or provide a response thereto. The invention also relates to a user-configurable instrument designed as a system on a chip (SoC) or as a stand-alone, handheld, user-wearable, or implantable device with functionality defined through a Graphical User Interface (GUI) or other methodology.

The system can include a user transparent configuration mechanism that automatically configures the connection elements of the configurable chip module system or device in response to receiving selections entered on a user interface, where the user interface allows a user to input commands to modify the structure of the chip module system or function of the device by desired function rather than by assembling individual components of such system or device.

### Patent Family 3 (ECT)

The ECT patent family for electrochemical treatment of tissues includes 3 patents: US Patent No. [6,021,347](#) entitled "Electrochemical Treatment of Malignant Tumors"; and US Patent No. [6,708,066](#) and US Patent No. [7,526,334](#) both titled "Electrochemical Treatment of Tissues, Especially Tumors". Each of them describe an electrochemical technique and apparatus adapted to treat, *in situ*, a tissue to destroy all or a selected portion of it for the benefit of the patient, and most especially for treating a malignant tumor or other form of neoplasm in order to destroy cancerous tissues with minimal damage to healthy tissues. Continuation/CIP application is possible.

In one embodiment of the invention, a voltage is applied across strategically placed electrodes causing a current to flow through the tissue, producing an electrochemical reaction yielding multiple reaction products, at least one of which is a cytotoxic agent destructive of the particular tissue cells desired to be eliminated. The voltage is controlled during electrochemical reactions produced in the tissue via a control unit, to optimize the yield of those reaction products which act as cytotoxic agents. Various other embodiments to create cytotoxic agents are also claimed.

### Patent Family 4 (EMF)

The EMF patent family includes 2 patents: US Patent No. [7,160,241](#), entitled "Treatment of Living Tissues Using Electromagnetic Fields" and US Patent No. [7,517,311](#), entitled "Modulation of Myosin Phosphorylation Using Electromagnetic Fields," which relate to apparatuses and methods for diagnosing and/or treating tissues/cells using electromagnetic fields, and for determining therapeutically useful electromagnetic fields, and harmful electromagnetic fields.

### Patent Family 5 (delivery)

US Patent Application No. 12/098,257, entitled "Electronic Delivery Systems and Methods with Feedback" and published as U.S. Patent Pub. No. US 2011/0230857 has been abandoned and included in co-pending US Patent Application No. 13/475,833 in Patent Family 6, now US Patent No. [9,199,076](#). It is possible to extract the subject matter and file a continuation or CIP application.

In accordance with some embodiments of the present invention, delivery systems and methods for delivering a substance in a medium is provided. The delivery system may include a delivery component, an electronic controller, one or more sensors, and a feedback mechanism. The delivery component has at least one reservoir that contains a substance (e.g., a liquid, a drug, etc.). The electronic controller is connected to the delivery component and controls the release of the substance from the at least one reservoir into the medium. The sensors monitor one or more parameters in the medium and provide a signal to the feedback mechanism. The feedback mechanism, in response to the signal, sends an electrical signal that directs the controller to release the substance from the reservoir into the medium, thereby maintaining a desired level of a monitored parameter (e.g., pH, pO<sub>2</sub>, temperature, pressure, ions, volume, impedance, dosage, biomarkers, etc.).

In an individualized delivery system, such as for drug delivery, feedback can monitor sensitive parameters such as level, dosage, and timing for highly effective delivery, which may be especially attractive for long-term treatment, for example for persistent pain associated with chronic headache, disease-associated neuropathies (diabetic, post-herpetic, etc.), peripheral ischemia, back pain, or for controlled chemotherapy.

### Patent Family 6 (diagn/treatm)

US Patent No. [9,199,076](#) entitled "Method and Apparatus for Diagnosis and Treatment" is a combination of the original US Patent Application No. 12/485,855 (Pub. No.: US 2011/0224502 A1) and the Patent Family 5 patent application No. 12/098,257 (see above). A continuation application of US Patent No. [9,199,076](#), also entitled "Method and Apparatus for Diagnosis and Treatment", has been filed and has been assigned US Patent Application No. 14/954,441. The subject matter in the original, non-combined, application can be extracted and filed as a continuation or CIP application.

The invention relates to measurement, diagnostic, and treatment equipment and analysis methods which allow not only for performing multiple measurements and diagnoses simultaneously but also for long term monitoring of the disease, and for treatment in response to such monitoring, as well as for monitoring of treatment efficacy, which can have importance both for personalized medicine and for drug discovery.

Development of applications using versatile, flexible electrical systems has significant potential, not only in the treatment areas discussed above, but in emerging fields such as personalized medicine - in which treatment is tailored based on sensing and feedback regarding any number of biological parameters, which are specific to the individual's immediate condition and to the disease being treated or the wellness characteristic desired.