Title: ELECTRICAL STIMULATOR AND MODULAR ELECTRICAL STIMULATION SYSTEM

Abstract: An electrical stimulator and a modular electrical stimulation system comprise a pulse generator (10) driven by an external control unit (30), the unit being in turn controlled by a user interface (40) for entering or selecting electrical stimulation programs made available in a program store, for example an Internet site or a mass storage medium.
ELECTRICAL STIMULATOR AND MODULAR ELECTRICAL STIMULATION SYSTEM

Technical Field

The present invention relates to electrical stimulators, devices that generate current or microcurrent pulses in a controlled manner, transmitted to the body of a user or of a patient by means of electrodes.

Background Art

In recent years, owing to continuing technological improvement and to the high levels of safety achieved, there has been a great diffusion of electrical stimulation devices, which are widely used both in the medical and rehabilitation field and in the sports and cosmetic field.

Conventional electrical stimulators are independent devices, powered equally by internal batteries or by a connection to the civil electrical mains, which necessarily comprise at least the following elements: an internal control unit, which is substantially constituted by a microcontroller and by a memory, generally a read-only memory, which contains the data related to electrical stimulation programs preset by the manufacturer; a current source, which is designed to generate electrical pulses or microcurrent depending on the signal sent by the control unit; one or more pairs of electrodes, which are designed to be applied to the body of the user and through which current is transmitted to the corresponding points of application on the body of the user.

The control unit is usually provided with an interface that allows the user to select directly certain electrical characteristics of the waveform to be used for electrical stimulation, or to choose among the set of electrical stimulation programs preset within such unit, which are differentiated according to the purpose of use on the part of the user and according to the muscular part to be treated.

The expression "electrical stimulation program" is used to reference a
sequence of waveforms, characterized by a specific frequency and a given amplitude, and of pauses that have a fixed or user-modifiable duration, said sequence being aimed at a specific result.

Typically, electrical stimulators can have "toning", "strengthening", "capillarization" programs, pain relief programs, and others.

In general, the cost and constructive complexity of an electrical stimulation device depend on the number of available programs and on the number of pairs of electrodes managed by the control unit.

Unfortunately, modifying an electrical stimulation program or creating a new program in order to extend or modify the field of use of the device is a rather complicated operation. Often it is not even allowed, since an incorrect program can have even negative repercussions on the body of the user.

This leads to the need to have a plurality of electrical stimulation devices provided with different programs in order to cope with the various requirements of the user.

Clearly, the use of a specific control unit for every set of electrical stimulation programs or for every type of electrical stimulation, in addition to the logistic inconveniences that it entails, is also particularly onerous, both when the user is a private individual and when the user is a medical center or a sports or beauty center.

Moreover, only the actual use of an electrical stimulation unit allows the user to realize whether the device that he uses is capable of meeting his requirements and expectations.

If this does not occur, the lack of modularity of current devices forces the user to purchase a different model that integrates the missing functionalities, which are perhaps not deemed necessary at the time of purchase or are simply not available in a single model.

It is evident that in the background art there is a strong need to provide a new type of electrical stimulator both to cope with requirements of
versatility and to improve the quality/functionality/cost ratio of the electrical stimulation apparatus.

Disclosure of the Invention

The aim of the present invention is to provide an electrical stimulator and an electrical stimulation system that overcome the limitations and the problems highlighted in the background art described above.

Within this aim, an object of the present invention is to provide an electrical stimulator that has a low cost and is extremely versatile and whose electrical stimulation programs can be updated constantly and easily.

This aim and this and other objects that will become better apparent hereinafter are achieved by a modular electrical stimulation system, characterized in that it comprises an electrical pulse generator and a control unit that is external to the pulse generator and is connected thereto by means of suitable interface means. The control unit can comprise means for driving the pulse generator and means for receiving information from the pulse generator.

Conveniently, the system also comprises an electrical stimulation program store, which is external to the pulse generator, and a user interface, which is connected to the program store by means of a first communications channel that allows to interact with it in order to create, modify, store, select and activate the various electrical stimulation programs.

Advantageously, the control unit is connected to the user interface by means of a second communications channel and to the program store by means of a third communications channel. The various communications channels can mutually coincide or be separate.

The control unit and the interface unit can be contained within a same apparatus, for example a personal computer, or be separate elements and be arranged physically in different locations.
Brief description of the Drawings

Further characteristics and advantages of the invention will become better apparent from the following detailed description, illustrated by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a schematic view of an electrical stimulation unit according to the present invention;

Figure 2 is a schematic view of an embodiment of a modular electrical stimulation system according to the present invention;

Figure 3 is a schematic view of a second embodiment of a modular electrical stimulation system according to the present invention;

Figure 4 is a block diagram that illustrates schematically a user interface, provided for example by means of a cellular telephone;

Figures 5a and 5b are block diagrams that illustrate schematically first generic embodiments of a control unit;

Figure 6 is a block diagram that illustrates schematically the modules made available on a personal computer used as a control unit and as a user interface;

Figure 7 is a flowchart that exemplifies the use of the graphical interface module for selecting the electrical stimulation programs located in a remote program store;

Figure 8 is a view of the structure of an implementation of the data signal transmitted by a control unit to a pulse generator;

Figure 9 is a view of a first embodiment of the pulse generator;

Figure 10 is a view of a second embodiment of the pulse generator;

Figure 11 is a view of a third embodiment of the pulse generator;

Figure 12 is a view of an embodiment of an actuator electrode.

Ways of carrying out the Invention

Figure 1 illustrates the essential elements of an electrical stimulation unit
according to the present invention, which comprises at least a pulse
generator 10 and a plurality of electrodes 5 and 6 connected to the generator
10. The pulse generator 10 is further connected to a control unit 30, which
drives the generator.

Figures 2 and 3 illustrate complete modular electrical stimulation systems
according to the present invention, and illustrate the presence of first
transmission means 60 for mutually connecting control units 30, 31 and one
or more storage units 50, designated by the expression “program store”, and
one or more user interfaces 40, which allow interaction with the program
store in order to create, modify or acquire data and sequences of commands
that represent an electrical stimulation program.

In greater detail, Figure 2 illustrates the elements of an electrical
stimulation system according to the present invention, illustrating a generic
control unit 30, a generic user interface 40, and a device 31, for example a
personal computer, that integrates a control unit 30 and a user interface 40.

The control units and/or the user interfaces are connected to one or more
program stores 50 by means of a transmission means 60, which varies
according to the type of the program stores and of the control units
themselves, as described in greater detail hereinafter.

Figure 3 illustrates, in addition to the elements shown in Figure 2, second
transmission means 61, which can also coincide with the transmission means
60 and allow access to the program store 50 from additional stations 70
connected thereto.

The program store 50 is the storage unit where the information related to
the various electrical stimulation programs, particularly the sequences of
pulses that the pulse generator 20 must generate and transmit through the
electrodes 5, is stored originally.

In a first preferred embodiment, the program store is a database that can
be accessed by way of the transmission means 60 and 61 in order to create,
modify or update the electrical stimulation programs on the one hand and retrieve said programs on the other.

Purely for the sake of clarity in description, the transmission means 60 and 61 are shown as different means, wherein the transmission means 60 designate the path for connection toward the control units 30 and 31 while the transmission means 61 designate the path for connection toward the devices 70, typically personal computers, that can be used to update the database of the program store 50. However, the person skilled in the art easily understands that such a distinction is merely for illustration and is non-limitative.

The person skilled in the art can appreciate that the program store 50 can be any device, be it hardware, software or hybrid, suitable to store sequences of data that can be transferred to the pulse generator 10 by means of a control unit 30.

For example, in a preferred embodiment of the present invention, the program store 50 is an Internet site that is capable of accessing a database that contains several data sequences, each of which corresponds to a different electrical stimulation program.

In particular, the electrical stimulation programs can be entered by means of personal computers 70 that are connected to said site both by experts of the manufacturer, as a set of initial programs to be made available to users, and by third-party experts in order to provide specific electrical stimulation programs with various goals: medical, therapeutic, cosmetic and pain-relieving.

The program store 50, moreover, can be any mass storage device, particularly a CD-ROM, a DVD, a fixed or removable disk.

The general operation of the system, with reference to the figures, is as follows.

The pulse generator 10 is connected by means of the user interface 40 to
the selected control unit 30.

The control unit 30 receives a data sequence that corresponds to electrical stimulation programs contained in the program store, and converts said data into electrical signals that drive the generation of pulses on the part of the pulse generator 10.

The pulses are transmitted, through actuation electrodes 5, to the body of the user, after placing said electrodes on the muscular parts to be treated, which are optionally indicated in the program store itself and visualized by means of the user interface 40.

By proceeding in this manner, the end users can have the benefit of electrical stimulation sessions that are performed in the most comfortable and convenient location, for example at home, with the assurance that the activated electrical stimulator program is guaranteed directly or indirectly by the supervision of experts and without limiting the possibility to add new programs when this becomes necessary.

A user can thus have available a generic program library that is virtually unlimited and aimed at the most disparate effects, such as muscle strengthening or toning, and programs aimed specifically at his own requirements and prepared specifically by his trainer, for example a program for inflammation reduction or pain relief prepared by his physician or physiotherapist.

It should be noted that in this case the use of the Internet and of personal computers used as user interfaces and as control units and connected to a pulse generator according to the invention allows simple and low-cost utilization of means that are already available to most users, combined with the convenience of being able to proceed directly at one’s home and taking advantage of periods of physical inactivity, for example the reading of a book or the viewing of a movie.

Therefore, not only does this modularity of the system overcome the
problems related to the limitation of the electrical stimulation programs or to
the difficulty of entering a new program where this is possible; it also
drastically reduces manufacturing and purchase costs, since the specific cost
for an electrical stimulator according to the present invention is limited to
the cost of an apparatus that has a much smaller number of elements than
required by the background art.

A fully equivalent embodiment consists in using the system described
above within an Intranet 60, for example in beauty centers, fitness centers or
medical centers.

In this case, the center presets its own programs in the local or remote
program store 50 and makes them available to a plurality of users connected
to a plurality of pulse generators 10, which are driven by means of one or
more control units 30, which in the specific case can be dedicated hardware
devices capable of performing the operations for interpreting and encoding
the signals for driving the signal generators, or personal computers.

This modular distribution allows to control the electrical stimulation
programs in a controlled manner, by acting for example from a single user
interface 40, or from a single control station, with consequent centralization
of the work and cost optimization.

With reference to the described preferred embodiment, Figure 7
illustrates the typical steps that the user must perform in order to activate an
electrical stimulation program to be used in an electrical stimulator
according to the present invention.

Assuming that the user interface 40 is a personal computer connected to
the Internet 60, the user accesses, by means of a software application that is
made available on said personal computer, or simply by means of its
conventional Internet navigation program, a site whose address corresponds
to the program store 50.

Preferably, access to the service entails entering one’s own identification
data, particularly a user name issued in a first step, not described, of registration with the service, and a secret code. By means of the entered data, a server of the service provider can verify the identity of the user and, if the result of the operation is positive, it sends to the user interface 40 the data required to choose the enabled options, for example hypertext links, such as “Run Programs”, “Edit Programs”, “Enable Programs”, and so forth.

The user selects the intended option and proceeds accordingly: for example, if the user is a person skilled in the art and is authorized to perform entry, he can enter or modify an existing electrical stimulation program.

However, the typical case consists in choosing to run an electrical stimulation program whose choice is entered after selecting the “Run Programs” option or link.

Once the program has been chosen, the user can optionally modify certain operating parameters, for example the intensity and duration of the program, and once ready can launch the execution of said program, which is in practice performed by the control unit.

The technical implementation of these steps is a simple execution that is within the grasp of any programmer and can be performed with any currently existing language and programming environment, according to the preferences of the programmer. As such, it is not described in detail here.

As already mentioned, the user interface 40 and the control unit 30 can be contained within a same apparatus, as in the case described above and related to the use of a personal computer, or can be separate elements located physically in different places, for example in the case in which a physician, by means of his own user interface, defines the therapeutic protocol for one or more patients, whereat only the pulse generators 10 connected to control units 30 are present.

The user interface 40 is provided by utilizing a plurality of known generic devices, provided that they are capable of communicating with the program
store by means of a suitable transmission means 60.

In addition to the already-described case in which a personal computer is used for the purpose, the user interface can be constituted by a cellular telephone that is capable of interacting with the program store, typically by means of a WAP, HTTP or UMTS protocol, a fixed telephone of the type provided with an Internet browser, a decoder or a set top box provided with a cable or satellite link, and any device capable of accessing the Internet 60.

Generally, the high-level diagram of a user interface 40 suitable for the purpose is shown in Figure 4, which shows that the device used must be provided substantially with an interface 41 for input/output toward the transmission means 60, with data and command input means 42, typically a keyboard or a pointing device, with a screen 43, with memory means 44, and with a microprocessor 45.

Likewise, the high-level diagram of the control unit 30 is shown in Figures 5a and 5b.

In particular, Figure 5a illustrates the components that are essential for the operation of the system according to the present invention: an input interface 51, by means of which the control unit receives data from the program store and/or from the user interface, a signal encoder 52, and an interface 53 for output to the pulse generator 10.

It is evident that the control unit 30, too, can be implemented by using known devices that are already available to a wide user base, provided that they are programmed appropriately. By way of non-limitative example, the control unit 30 is preferably chosen from the group that comprises:

- a cellular telephone, which is capable of receiving, over the WAP, HTTP or UMTS protocols, commands received in input which arrive from the transmission means 60, and is provided with an analog or digital output, for example an infrared communications port, in order to control the pulse generator 10;
a fixed telephone, which is provided with an Internet connection and is also provided with an analog or digital output for controlling the pulse generator 10;

a television decoder or a set top box with cable or satellite link, also provided with an analog or digital output for controlling the pulse generator 10;

a generic apparatus capable of accessing the Internet and provided with an analog or digital output for controlling the pulse generator 10.

Figure 5b illustrates an extension of the control unit of Figure 5a that provides for bi-directional signal flow, not only from the program store 50 or from the user interface 30 to the pulse generator 10 but also in the opposite direction.

This is useful not only to collect statistical data on the behavior of the body of the patient but also to optimize the electrical stimulation programs, which can be changed instantaneously in order to adapt to the conditions of the patient, for example increasing or decreasing the intensity of the pulses or suspending their emission completely in abnormal situations.

In this context, some of the electrodes do not act as actuators 5 for transmitting the signal but act as sensors 6 for retrieving significant data, for example data on arterial pressure, heart rate, body temperature, environmental conditions and so forth, whose measured values are passed by the pulse generator 10 to a second input interface 56, are converted into a digital signal by an encoder 57, and are transmitted in output via a second output interface 58.

Again with reference to the preferred embodiment, which uses a single personal computer that is suitable to act as a user interface 40 and a control module 30, reference is now made to the block diagram of Figure 6.

If the program store 50 is located remotely with respect to the control unit 30 and the user interface 40, the user interface 40 is preferably an Internet
navigation program for accessing the program store and interacting with it, for example Microsoft Internet Explorer™ or Netscape Navigator™, while the input interface 51 can be a module for receiving data transmitted over the network 60, for example in broadcast mode, of the selected program.

The encoder 52 is a simple module for generating the sequence of digital signals, which typically comprise data related to signal frequency, duration and/or amplitude, preferably differentiated for each pair of actuator electrodes 5 to be controlled.

The output interface 53 is a module for sending the digital signal in output from one of the interface ports provided in the personal computer, for example a serial port, a parallel port, a USB port, or any other port capable of transferring an electrical signal.

The person skilled in the art clearly understands without any difficulty that the module for receiving signals on the input interface, the encoder and the module for sending data via the output interface can be integrated within a same dedicated software application.

With reference to Figure 8, the diagram illustrates a possible structure of the signal as encoded by a software or firmware encoder that runs on a control unit and is passed in input to the pulse generator.

The signal sent by the output interface of the PC to the pulse generator is composed as follows:

a first 2-byte informational block 81, which identifies a pair of electrodes;
a second 8-byte informational block 82, which indicates the frequency in Hz of the signal to be generated;
a third 8-byte informational block 83, which indicates the duration, in microseconds, of the pulse to be generated;
a fourth 8-byte informational block 84, which indicates the maximum current of the signal in mA;
a fifth 4-byte informational block 85, which indicates the percentage
position of the electrical zero with respect to the generated wave. In this case, 0% corresponds to the minimum value of the signal in the case of a positive unidirectional wave, 50% corresponds to the mean value between the maximum peak and the minimum peak of the signal in the case of a symmetric bidirectional wave, and 100% corresponds to the maximum peak value of the signal in the case of a negative unidirectional wave.

During research and design, it has been found that by using an encoder implemented on a personal computer provided with a USB version 1.1 connection (low speed = 1.5 Mbps, full speed = 12 Mbps) or a USB version 2.0 connection (high speed = 480 Mbps) and ten pairs of electrodes, it is possible to transmit all the various signals related to all the pairs of electrodes with a frequency of 30 Hz.

The person skilled in the art easily understands the efficiency of such a system. Assuming that 60 bytes are used to define a signal at a given time instant, 30 of said bytes being information and 30 of said bytes being transmission control bytes, for 10 channels and 30 transmissions per second it is necessary to have a transmission capacity of approximately 18 Kbytes per second.

Accordingly, even if use is limited to a USB version 1.1 low-speed connection at 1.5 Mbps and therefore approximately 187 Kbytes per second are available, the bandwidth usage required for the transfer of the data from the control unit 30 to the pulse generator is 10 times lower than the available bandwidth, thus allowing, if necessary, to drive a plurality of pulse generators 10 with a single control unit 30.

The pulse generator 10, i.e., the means that receives signal from the control unit 30 and generates the electrical pulses to be transmitted externally through the actuator electrodes 5, is described in greater detail hereinafter.

Figure 9 is a view of a first embodiment of the pulse generator 10; such
embodiment has, during the electrical stimulation session, a constant connection to the control unit 30.

The pulse generator 10 comprises an input and output interface 11, a D/A (digital/analog) converter 12, a wave generator 13, an amplifier 14 and a current measurement device 15, in addition to power supply means 16 that are connected to a switch 17 and to a power-on indicator 18.

In greater detail, the input and output interface 11 is a means for connection to a control unit 30, through which the digital signal that regulates the generation of electrical pulses is received in input and through which optional information acquired through sensor electrodes, as anticipated and as described better hereafter, is sent in output.

The D/A converter 12 is a module for converting the signal from digital to analog. Such module can have one or more analog outputs in order to control certain parameters of the wave generator 13, for example the frequency, amplitude and duration of the wave, or any other equivalent parameter.

The wave generator 13 is the module that performs the actual generation of the electrical pulses in accordance with the commands transmitted through the D/A converter 12. The wave generator 13, furthermore, is connected in output to an amplifier 14, which is useful to increase the power of the signal and adapt it to the impedance conditions that are present between the various pairs of electrodes 5.

The amplifier 14 is in turn connected to a current and voltage measurement device 15, which is designed to measure and monitor the electrical parameters sent to the electrodes 5, in order to ensure the correct operation of the amplifier 14 and prevent the passage of any abnormal signals that are potentially harmful to the user's physiology and are due to malfunctions of the apparatus, for example at current peaks, voltage drops or even incorrect electrical stimulation programs. Said module is therefore a
safety device, which is separate from the amplifier 14 for the sake of clarity but can in practice be included in said amplifier block.

Finally, the power supply means 16, typically batteries or a power supply connected to the electrical mains, supply the electric power required for the operation of the devices that are present inside the generator 10.

The power supply means 16 are activated by a conventional on-off switch 17 and are preferably connected to a luminous indicator 18, which indicates the activated or deactivated status of the pulse generator. Obviously, the power supply means 16, the switch 17 and the indicator 18 can all be integrated in the same container as the pulse generator 10 or can be arranged in a separate and autonomous container that is connected by means of a cable to the container of the pulse generator.

A second embodiment of the pulse generator 10 is shown in Figure 10. Said embodiment differs from the first embodiment in that it can operate, during an electrical stimulation session, both in a mode that entails a permanent connection to an external control unit 30, as in the case illustrated above, and in an autonomous mode, limiting the need for connection to a control unit 30 only to certain steps of the electrical stimulation process.

In this case, in addition to the elements described above with reference to Figure 9, the pulse generator 10 provides for the presence of a microprocessor 19 and of memory means 20, as well as of a keypad 21 and a display 22.

The microprocessor 19 is the unit designed to process both the signals that arrive from the input interface and from the commands imparted by a user by means of the keypad 21, and sends to the pulse generator commands that correspond to the selected electrical stimulation program.

The keypad 21 is therefore a module that allows to interact with the pulse generator 10 in order to select an electrical stimulation program, any increase in the power delivered by the electrodes 5, and so forth.
The display 22 is a module for displaying information of various kinds, such as for example the operating state of the pulse generator, the program currently running, and so forth. The display 22 obviously can be present also in the preceding embodiment, although in that case it is not necessary, since all the relevant information can be displayed by means of the user interface 40 that is used or by means of a display of the control unit 30 itself.

Finally, the memory means 20 designate a memory of any kind that can store data and commands to be sent to the wave generator 13, particularly one or more electrical stimulation programs that originate from a control unit 30 and are received before the electrical stimulation session starts.

The difference between the two embodiments of the pulse generator 10 described above is therefore evident. In the first case, the pulse generator must in fact be connected constantly to a control unit 30, since said control unit is required to drive the generator during an electrical stimulation session.

In the second case, the operation of the system remains the same, but the pulse generator 10, being provided with its own memory and command means, is capable, after acquiring at least one electrical stimulation program from the program store 50, of operating autonomously according to the stored data.

Figure 11 schematically illustrates some additional modules, which can be integrated in both of the illustrated embodiments and allow to acquire information from the body of the user and transmit it to the control unit 30 and/or to the microprocessor 19 and to the memory means 20.

In particular, said modules comprise sensors 6, an input interface 23 for the signal acquired by the sensors, an A/D converter 24 for converting the signal from analog to digital, and an output interface 25 for sending the signal to a control unit 30.

If the pulse generator 10 is provided with memory means 20 and/or with
a microprocessor 19, the resulting digital signal can be stored in the memory means or used by the microprocessor, which is programmed appropriately, for example in order to vary said electrical stimulation program.

Finally, Figure 12 illustrates a preferred embodiment of the electrodes 5, with particular reference to the actuation elements, which allow to apply the electrical pulses in the body regions of interest.

The electrode, shown schematically both in plan view and in a front view, is constituted by a conducting wire 90 for connection to the pulse generator 10 and by a plate 91.

The plate 91, in turn, preferably comprises a first outer insulating layer 92, which is used to insulate the outer surface of the electrode and prevent accidental contacts from causing an electrical discharge, a plate made of conducting material, which is useful to enlarge the electric charge transfer surface, and an adhesive 94 made of a conducting material, which is suitable to facilitate and ensure contact with the surface to be subjected to electrical stimulation. Clearly, the electrodes 91 can have different shapes and dimensions according to the body surface to be treated.

It has thus been shown that the proposed electrical stimulator and the electrical stimulation system in which it can be included allow to achieve the intended aim and object. It has in fact been found that the claimed invention allows to separate the physical device that performs the electrical stimulation, which is constituted by a pulse generator and by electrodes connected thereto, from the actual control unit, which can be provided by using a variety of generic devices that are already available to many users.

It has also been found that dividing the system into modules allows to arrange the various components required for the operation of an electrical stimulator, with a consequent possibility of access to the system and interaction therewith that is not feasible in the background art. Moreover, the flexibility of the system has been demonstrated; said system can be used
easily in various domestic or professional environments without requiring the purchase or replacement of expensive devices or the development of electrical stimulation programs that are specific for a given device.

Clearly, numerous modifications may be performed promptly by the person skilled in the art without abandoning the scope of the protection of the present invention, and it is also evident that the inventive concept on which the present invention is based is independent of the actual implementation of the illustrated software modules, which can be provided in any language and on any hardware platform, and likewise the description of the hardware parts that have been illustrated must not be considered as limitative in any way, said parts being replaceable with any equivalent instrument.

Accordingly, the scope of the claims must not be limited by the illustrations or by the preferred embodiments illustrated in the description as examples, but rather the claims must comprise all the characteristics of patentable novelty that reside within the present invention, including all the characteristics that would be treated as equivalent by the person skilled in the art.

The disclosures in Italian Patent Application No. MO2002A000071 from which this application claims priority are incorporated herein by reference.
CLAIMS

1. A modular electrical stimulation system, characterized in that it comprises at least an electrical pulse generator and a control unit that is external to said pulse generator and is connected thereto by way of interface means.

2. The modular electrical stimulation system according to claim 1, characterized in that said control unit comprises means for driving said pulse generator.

3. The modular electrical stimulation system according to claim 2, comprising a store for electrical stimulation programs that is external to said pulse generator.

4. The modular electrical stimulation system according to claim 3, further comprising a user interface that is connected to said program store by means of a first communications channel in order to interact with said program store.

5. The modular electrical stimulation system according to claim 4, characterized in that said control unit is connected to said program store by means of a second communications channel.

6. The modular electrical stimulation system according to claim 4, characterized in that said control unit is connected to said user interface by means of a third communications channel.

7. The modular electrical stimulation system according to claim 4, characterized in that at least two among said first, second and third communications channels coincide.

8. The modular electrical stimulation system according to one of claims 5, 6 or 7, characterized in that said control unit is selected from the group that comprises:
   -- a personal computer;
   -- a fixed telephone;
-- a cellular telephone;
-- a set top box.

9. The modular electrical stimulation system according to claim 5 or 7, characterized in that said first communication channel is the Internet.

10. The modular electrical stimulation system according to claim 3, characterized in that said program store is selected from the group that comprises:
-- an archive that can be accessed via an Internet address;
-- an archive that can be accessed via an Intranet address;
-- a mass storage medium.

11. The modular electrical stimulation system according to claim 2, characterized in that said control unit comprises means for receiving information sent by said pulse generator.

12. An electrical stimulator, comprising at least a pulse generator for generating electrical pulses and a plurality of electrodes connected thereto, characterized in that said electrical stimulator is provided with means for interfacing with a control unit that comprises means for driving said generator.

13. The electrical stimulator according to claim 12, characterized in that said control unit is selected from the group that comprises:
-- a personal computer;
-- a fixed telephone;
-- a cellular telephone;
-- a set top box.

14. The electrical stimulator device according to claim 12, characterized in that it comprises:
-- a D/A encoder for converting the digital signal received via said interface means into an analog signal;
21

-- a wave generator for generating electrical pulses on the basis of said analog signal.

15. The electrical stimulator according to claim 14, further comprising:
-- a plurality of sensors for acquiring external analog informational data;
-- an A/D converter for converting into digital format said informational data.

16. The electrical stimulator according to claim 13 or 14, further comprising at least one microprocessor and memory means.

17. The electrical stimulator according to claim 16, characterized in that said memory means are suitable to store at least one electrical stimulation program, which is transmitted by said control unit, and in that said microprocessor is suitable to drive said wave generator on the basis of the content of said memory means.
FIG. 7

FIG. 8