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Electrosurgical instrument and electrosurgical system with an electrosurgical generator

Abstract

An electrosurgical instrument with at least one active electrode for effecting an electrosurgical treatment with an instrument data memory. Furthermore, the electrosurgical instrument has a connector for a connecting cable or a connected connecting cable including supply lines for supplying the active electrode with a high-frequency alternating current required for an electrosurgical treatment. The instrument data memory has at least one read-write area to which usage and status data can be written by an electrosurgical generator.

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Background/Summary

(1) The invention relates to an electrosurgical instrument and an electrosurgical system with an electrosurgical generator for supplying high-frequency alternating current to an electrosurgical instrument.

(2) An electrosurgical system generally comprises an electrosurgical generator for generating the high-frequency alternating current. As a general rule, the electrosurgical generator has two or more outputs where an electrosurgical instrument can be connected, and a high-frequency AC voltage is

provided between these outputs during operation. In addition, an electrosurgical generator generally comprises a high-voltage power supply that generates direct current during operation, and a high-frequency part that is connected to the high-voltage power supply and generates a high-frequency alternating current from the direct current during operation.
(3) Typically, different electrosurgical instruments can be connected to the electrosurgical generator for different tasks that have different requirements regarding the generator depending on the respective electrosurgical instrument.
(4) Electrosurgery can be used for cutting, coagulating (obliterating) and/or vaporizing biological tissue, i.e. body tissue. High-frequency alternating currents with a frequency between 0.2 MHz and 3 MHz are typically used in electrosurgery. Electrosurgical instruments are typically handheld instruments that a surgeon can use to coagulate, ablate and/or cut body tissue.
(5) To this end, the electrosurgical instruments are supplied with high-frequency electrical energy, by means of which tissue can be coagulated or cut in a targeted manner. The high-frequency electrical energy is supplied by the electrosurgical generator and applied to the body tissue by means of the electrosurgical instrument that is appropriate in the respective case. Depending on what the electrosurgical instrument is used for, specific current and voltage curves are required; these current and voltage curves are made available to the physician for selection at the electrosurgical generator in the form of operating modes (also referred to as modes). These operating modes are permanently stored in the electrosurgical generator.
(6) A simple programmable supply device for an electrosurgical instrument is known from WO 2011/032729 A1. The simple programmability results from defined possible states of a state machine, which, however, also limit the flexibility of the supply device.
(7) The invention is based on the task of creating an electrosurgical instrument that can be operated flexibly and safely with an electrosurgical system.
(8) To this end, the invention proposes an electrosurgical instrument, an electrosurgical system and an electrosurgical generator which can each individually and in combination with each other, on the one hand, allow for a very flexible operating mode, and, on the other hand, allow for operating modes that are tailored to a particular application and/or to a particular electrosurgical instrument.
(9) An electrosurgical instrument according to the invention comprises at least one active electrode for effecting electrosurgical treatment and an instrument data memory. Furthermore, the electrosurgical instrument has a connector for a connecting cable or a connected connecting cable comprising supply lines for supplying the active electrode with a high-frequency alternating current required for an electrosurgical treatment. The electrosurgical instrument further comprises at least one data interface for reading data from the data memory and for writing data to the data memory. The data interface may be configured for wired or wireless data exchange between an electrosurgical generator and the electrosurgical instrument. The instrument data memory is preferably partitioned and preferably has at least one read-write partition (read-write area) and one configuration area (Config Area); of these, usage and status data can be written to the read-write partition.
(10) A connected electrosurgical generator can write usage and status data to the read-write partition during operation of the electrosurgical instrument. This makes it possible to ensure safe operation of the electrosurgical instrument with an electrosurgical generator. Usage and status data may include e.g. activation and mating times, activation energies, fault conditions, or remaining activation cycles of the electrosurgical instrument. The definition of the usage and status data to be stored can be stored completely in a read-only area of the instrument data memory, so that even after a new electrosurgical generator has been launched on the market, adjustments to the usage and status data are possible via the programming of the electrosurgical instrument.
(11) The instrument data memory of the electrosurgical instrument preferably contains data sets with structured data which contains references to operating specifications stored in a generator data memory of an electrosurgical generator. Such an electrosurgical instrument can therefore contain

the necessary information that allows for an operating mode that is adapted to the respective electrosurgical instrument, without said operating mode having to be completely defined by the electrosurgical instrument.

(12) For the data sets with structured data which contains references to operating specifications stored in a generator data memory of an electrosurgical generator, the instrument data memory of the electrosurgical instrument preferably has a further partition; however, this partition only offers a read function, not a write function during operation of the electrosurgical instrument. Accordingly, the instrument data memory preferably has a read-only area as a further partition. The data sets with structured data stored in the read-only area of the electrosurgical instrument fit a data structure in a generator data memory of an electrosurgical generator, which can be used to operate the electrosurgical instrument and which can be made up of a plurality of data sets with structured data. The structured data contains references to specific operating specifications from a plurality of operating specifications stored in the generator data memory of the electrosurgical generator, and defines those specific operating specifications, such as control commands or parameter values, that are to be applied to the respective operation of the electrosurgical instrument in a particular operating mode. During operation of the electrosurgical generator, the references defined by the structured data are called up by a processor according to an operating program that is being executed at that time and translated into operating specifications that the processor can then apply in connection with the operating program. This will be explained in more detail below in connection with the description of the electrosurgical generator.

(13) The electrosurgical instrument is preferably a hand-held instrument with a handle and a shaft, upon which the active electrode is arranged. The data memory is preferably located in the handle of the electrosurgical instrument.

(14) The instrument data memory of the electrosurgical instrument is preferably non-volatile, but re-writable. This is advantageous because current status and usage data regarding the electrosurgical instrument can be written to such data memory, and this status and usage data is retained even when the electrosurgical instrument is not in use.

(15) Preferably, at least the structure of the read-write area of the instrument data memory is defined by a data allocation table that is preferably stored on an electrosurgical generator for operating the electrosurgical instrument.

(16) The electrosurgical instrument is preferably part of an electrosurgical system that comprises, in addition to the electrosurgical instrument, also an electrosurgical generator to which the electrosurgical instrument is connected during operation. The electrosurgical generator has a processor and at least one generator data memory in which an operating program for controlling the operation of the electrosurgical generator in combination with the electrosurgical instrument is stored. Independently of the connection of an electrosurgical instrument, a theoretical arbitrary number of operating specifications are stored in the generator data memory of the electrosurgical generator, which can be called up by the operating program and can thus potentially be applied and influence the operation of the electrosurgical generator, but which do not define any fixed operating sequences. The operating specifications can, on the one hand, be control commands, command strings and/or conditional strings, but, on the other hand, also parametric data, such as values for the output voltage, output currents, output power, time settings, threshold values, error conditions, etc.

(17) The operating specifications stored in the generator data memory can be understood as a library of any plurality of potentially applicable control instructions that can be accessed by the operating program. However, these operating specifications are not accessed directly, so that the operating program and the operating specifications as content of the generator data memory do not yet determine the mode of operation of the electrosurgical generator.

(18) Rather, a data structure, in which arbitrary data sets with structured data are stored, is also provided. The structured data contains references to concrete operating specifications, such as

control commands or parameter values stored in the generator data memory. During operation of the electrosurgical generator, the references defined by the structured data are called up by the processor according to the operating program that is being executed at that time, and the associated operating specifications are applied by the operating program.
(19) Thus, the specific mode of operation of the electrosurgical generator depends on three different types of stored data, namely on the data in the generator data memory which defines the operating program; on the potentially applicable operating specifications in the generator data memory, which define e.g. control commands or parameter values, and some of which are specifically applied because of the references contained in the data structure; on the data sets with structured data stored in the data structure, which contain the references to specifically applicable operating specifications and which are called up by the processor during the course of the operating program and translated into specifically applicable operating specifications.
(20) The three types of data—operating program, operating specifications and structured data of the data structure—can be changed and specified independently, with the limitation that the data formats are compatible. Thus, the mode of operation of the electrosurgical generator in a respective operating mode can be changed by modifying the operating program stored in the generator data memory, or by modifying the operating specifications that are also stored in the generator data memory, or by modifying the structured data in the data structure, or also through a combination of these changes. The data structure can be available in either the generator data memory or the instrument data memory, or in both data memories.
(21) The generator data memory preferably contains a data allocation table that at least defines the structure of the read-write area of the instrument data memory of the electrosurgical instrument.
(22) The electrosurgical instrument preferably contains the non-volatile instrument data memory (e.g. an EEPROM or similar), but no processor. On the instrument data memory of the surgical instrument, in addition to the usage and status data stored in the read-write area, there is a data set, preferably stored in the read-only area, with structured data containing references to operating specifications and, if applicable, parameter values. The structured data of this data set is compatible with the data structure of the electrosurgical generator and may form the data structure of the electrosurgical generator or a part of the data structure of the electrosurgical generator.
(23) The data structure can thus be part of a generator data memory, which is a physical component of the electrosurgical generator, or it is formed by the content of the instrument data memory of the electrosurgical instrument, or by a combination of a generator data memory of the electrosurgical generator and the instrument data memory of the electrosurgical instrument. Preferably, the data structure is stored at least partially in a separate partition of the data memory of the electrosurgical instrument, namely the read-only area.
(24) The processor of the electrosurgical generator is configured, in combination with the operating program, to read and write to the instrument data memory of the electrosurgical instrument. The preferably provided partitioning of the memory of the electrosurgical instrument ensures that the data structure in the partition forming the read-only area can only be read, but not written to, by the electrosurgical generator during the normal electrosurgical operation. On the other hand, the electrosurgical generator can—and should—be able to write to the partition with the read-write area, namely to write status and usage data regarding the respective electrosurgical instrument. To this end, a data allocation table is stored in the generator data memory.
(25) The writing of status and usage data is preferably done by defining corresponding references to control commands within the structured data. The data is then stored according to the data allocation table defined in the generator (tag1+value1, tag2+value2, . . .).
(26) The reading of status and usage data is also done via the data allocation table. For example, after an electrosurgical instrument has been connected to the electrosurgical generator, the electrosurgical generator reads the read-write partition of the instrument data memory and decodes the status and usage data according to the data allocation table, and can act on it independently, e.g.

to display instrument information.

(27) The processor of the electrosurgical generator can be configured by the operating program to read the instrument data memory of the electrosurgical instrument—in particular the read-only area and the read-write area—after the electrosurgical instrument has been connected to the electrosurgical generator and before the electrosurgical generator is operated in an operating mode. The processor of the electrosurgical generator can be configured by the operating program to transfer the data set or the data sets or the structured data contained in the data set or the data sets into a data structure that is stored in the generator data memory of the electrosurgical generator.

(28) The processor of the electrosurgical generator can alternatively be configured by the operating program to read the instrument data memory of the electrosurgical instrument while the operating program is running—i.e. while the electrosurgical generator is being operated in an operating mode. Thus, no computer program or algorithm is stored in the instrument data memory of the surgical instrument, and the structured data is neither readable as a computer program nor as an algorithm associated with a program.

(29) The structured data—including the structured data stored in the partition making up the read-only area of the data memory of the electrosurgical instrument—preferably contains parameterized references. The references enable the targeted calling up of operating specifications, such as control commands, by means of the operating program.

(30) The structured data is preferably available in a memory-efficient binary format consisting of a 1-byte reference and additional information required for the operating specification.

(31) The electrosurgical system preferably has a programming interface, or several programming interfaces, by means of which the content in particular of the generator data memory and in particular of the data structure can be programmed with the structured data. Accordingly, it may also be provided that the operating program in the generator data memory can be changed via a programming interface, for example by way of a software update of the electrosurgical generator via USB.

(32) The invention also proposes a method for operating an electrosurgical instrument according to the invention by means of an electrosurgical generator, according to which method, during operation of the electrosurgical instrument, the electrosurgical generator writes usage and status data relating to the electrosurgical instrument to the read-write area of the data memory.

(33) Preferably, operating specifications and a data structure are provided in memory areas of the generator data memory of the electrosurgical generator that are independent of each other, wherein the data structure contains references to the operating specifications, and the processor indirectly accesses individual operating specifications, while the operating program is running, by first accessing references in the data structure and subsequently retrieving that operating specification or those operating specifications to which a respective reference refers.

(34) The data structure is preferably read from an instrument data memory of an electrosurgical instrument, and preferably after an electrosurgical instrument has been connected and before it is used. The data sets with structured data contained in the data structure on the electrosurgical instrument can be transferred into a data structure that is stored on an electrosurgical generator.

(35) A further aspect of the invention is an electrosurgical generator for operating the electrosurgical instrument. The electrosurgical generator has connections for connecting the electrosurgical instrument as well as a processor and at least one generator data memory, which contains first data that defines an operating program for controlling the operation of the electrosurgical generator in conjunction with the electrosurgical instrument; contains second data that defines the operating specifications that can be called up by the operating program and influence the operation of the electrosurgical generator, but which do not define any fixed operating sequences; and contains third data, which defines a data structure containing data sets with structured data that contains references to individual operating specifications.

(36) The electrosurgical generator is configured to read usage and status data stored in the data

memory of the electrosurgical instrument when an electrosurgical instrument according to the invention is connected to the electrosurgical generator, and to store usage and status data in a read-write area of the instrument data memory of the electrosurgical instrument during operation with an electrosurgical instrument according to the invention.
(37) Such an electrosurgical generator can easily be used with a variety of different electrosurgical instruments, wherein the adaptation to the respective electrosurgical instrument can be made solely by means of corresponding entries in the data structure which represent references, without the operating specifications in the generator data memory of the electrosurgical generator having to be changed. In particular, it is possible to make the operation of a specific electrosurgical instrument also dependent on status and usage data stored on this electrosurgical instrument.

Description

(1) The invention will now be explained in more detail based on exemplary embodiments referencing the figures. The figures show the following:
(2) FIG. **1**: An electrosurgical system with an electrosurgical generator and an electrosurgical instrument connected thereto;
(3) FIG. **2**: An electrosurgical instrument;
(4) FIG. **3**: A schematic diagram of an electrosurgical generator;
(5) FIG. **4**: A schematic illustration of a processor in combination with a generator data memory of the electrosurgical generator of FIG. **3**;
(6) FIG. **5**: A schematic illustration of an alternative configuration of the processor in combination with a generator data memory of the electrosurgical generator of FIG. **3**; and
(7) FIG. **6**: An example of a definition of usage and status data to be stored in the electrosurgical instrument.
(8) FIG. **1** shows an electrosurgical system **10**. The electrosurgical system **10** comprises an electrosurgical generator **12** and an electrosurgical instrument **14**. Via a connecting cable **16**, the electrosurgical instrument **14** is connected to electrical outputs and inputs **18** of the electrosurgical generator **12**.
(9) The electrosurgical instrument **14** has a shaft **20**, at the end of which is an active electrode **22**. The shaft **20** is attached to a handle **24** of the electrosurgical instrument **14**.
(10) The electrosurgical instrument **14** features a writable, preferably non-volatile instrument data memory **26**. The instrument data memory **26** can be an EEPROM (electrically erasable programmable read-only memory), for example. An EEPROM is a non-volatile data memory that can be read, written, and write-protected. The data memory **26** is, for example, located in the handle **24** of the electrosurgical instrument **14**.
(11) The connecting cable **16** contains both supply lines **28** and **30** as well as at least one data line **32** for reading data from the data memory **26** and for writing data to the instrument data memory **26**. The supply lines **28** connect the active electrode **22** and another neutral electrode, that is not described in more detail, to the electrical outputs **18**.**1** and **18**.**2** of the electrosurgical generator **12**. Via the data line **32**, the instrument data memory **26** is connected to a corresponding connection **18**.**3** of the electrosurgical generator **12**. This is shown schematically in FIG. **2**.
(12) The data line **32** in the connecting cable **16** as well as the connection **18**.**3** can be a multicore and/or multi-pole line/connection. In addition to or instead of the data line **32**, a wireless interface may be provided for the data transfer from the electrosurgical instrument **14** to the electrosurgical generator **12**. Such a wireless interface may, for example, be a Bluetooth interface, an NFC interface or an RFID interface.
(13) The data memory **26** of the electrosurgical instrument **14** is partitioned and, in particular, has a partition forming a read-write area from which the usage and status data can be read or to which

usage and status data can be written. The reading and writing of the usage and status data is done via a data allocation table. The data allocation table is preferably stored in a generator data memory **72** of the electrosurgical generator **12** for operating the electrosurgical instrument **14**.
(14) Usage and status data to be stored in the partition of the data memory **26** forming the read-write area can be, for example, activation and mating times, activation energies, fault conditions or remaining activation cycles. This usage and status data is to be stored completely in the electrosurgical instrument **14** so that even after an electrosurgical generator has been launched on the market, adjustments to the usage and status data to be stored are possible via the programming of the electrosurgical instrument **14**. The instrument data memory **26** may be partitioned. In this case, the memory model must fit into the existing partitioning of the data memory **26** of the electrosurgical instrument **14**. This is shown in Table 1 below. Specifically, an area of definable size is available, the so-called read-write area, in which the usage and status data can be stored.
(15) TABLE-US-00001 TABLE 1 Area Description 1 Legacy Tables Mode information for legacy systems 2 Config Area Description of the subsequent areas (e.g. size information) 3 Read-only Structured data that, in addition to the operating Area mode, primarily also defines the status and usage data to be stored. 4 Write-Protect Chip-specific attachment data for the read data Block area Alignment 5 Read-write Status and usage data for exchange between Area instrument and electrosurgical generator 6 Write-Protect Chip-specific attachment data for the read and Block write data area Alignment 7 Next Table(s) Memory space for additional mode tables 8 Last Config Final configuration Area
(16) The read-write area is an area for the memory model according to the invention, so that status and usage data can be stored.
(17) To meet the above-mentioned requirements, the instrument data memory **26** of the electrosurgical instrument **14** is provided with a memory model defined by a data allocation table, as shown in Table 2 below. The data allocation table must be known to all reading and recording devices, but, according to the exemplary embodiment, is not stored in the instrument data memory **26** of the electrosurgical instrument **14**. The data allocation table is preferably stored in the generator data memory **72** of the electrosurgical generator **12**.
(18) TABLE-US-00002 TABLE 2 Exemplary Data Allocation Table Size Name ID Description [Byte] Type NONE 0 No data 0 N/A RTOU 1 Counter #1 for 2 2 byte unsigned ultra-sound integer counter activations TIMESTAMP 2 Timestamp 4 4 byte unsigned (e.g. last integer mating time) timestamp ENERGY 3 Energy (e.g. 4 4 byte unsigned supplied integer energy energy of the last activation) ACTIVATIONTIME 4 Activation time 4 4 byte unsigned (e.g. time of the integer number last activation) GENERIC 5 General data 4 4 byte float value ACTIVATION_COUNT 6 Counter #2 for 4 4 byte unsigned ultra-sound integer counter activations RTOU is the abbreviation for “remaining times of use”
(19) Specifically, the data allocation table defines different identifiers (tags) that, in turn, define the size of the subsequent data (e.g. 4 bytes), and the type of the subsequent data (e.g. timestamp).
(20) The data to be exchanged and stored can be defined with a programming interface **82** (see later in the text) and finally stored in the read-write area of the instrument data memory **26** of the electrosurgical instrument **14** as a sequence of identifier (tag) and value. The sum of the data determines the size of the read-write area and is preferably stored in the configuration area (Config Area) of the electrosurgical instrument during programming and partitioning of the instrument data memory **26** of the electrosurgical instrument **14**. The electrosurgical generator **12** can read the data of the read-write area. The identifiers (tags) define which data the electrosurgical generator **12** should read and process and which data it should update.
(21) FIG. **6** shows an example of a definition of usage and status data by means of a programming interface **82** described below.
(22) During operation, the AC output voltage that is to be supplied to the active electrode **22** and a return electrode of the electrosurgical instrument **14** for the operation of the electrosurgical

instrument **14** is provided by the electrosurgical generator **12**. As shown in FIG. **3**, the electrosurgical generator **12** has a high-voltage power supply **40** for this purpose, which can be connected to the usual public power grid, for example, and provides a high-frequency direct current with DC output voltage at its output **42**. This direct output current is supplied to a high-frequency part **44** of the electrosurgical generator **12**. The high-frequency part **44** of the electrosurgical generator **12** serves as an inverter and produces a high-frequency AC output voltage that is supplied to the outputs **18.1** and **18.2** of the electrosurgical generator **12** via an output transformer **46** of the high-frequency part **44**. The electrosurgical instrument **14** can be connected to the outputs **18.1** and **18.2** of the electrosurgical generator **12**, as shown in FIGS. **1** and **2**.
(23) To control the AC output voltage of the electrosurgical generator **12**, a generator control unit **48** is provided that controls the AC output voltage at the outputs **18.1** and **18.2** of the electrosurgical generator **12** based on a maximum AC output voltage value such that, for example, a preset maximum output voltage value is not exceeded during operation.
(24) The AC output voltage of the electrosurgical generator **12**—and therefore also the alternating output current and the output power—can be controlled by a generator control unit **48**.
(25) The generator control unit **48** controls the high-voltage power supply **40** in dependence on maximum values defined by a respective operating mode and on current values of the AC output voltage, the peak output voltage, the alternating output current, the DC voltage portion of the AC output voltage or the DC output voltage detected during operation by detection units **54**, **56** and **58**, or on a combination of values of these parameters.
(26) The specific maximum values and the time sequence for generating the AC output voltage of the electrosurgical generator **12** and their dependence on detected momentary values depend on the respective operating mode (mode) in which the electrosurgical generator **12** is currently being operated.
(27) An operating mode is, for example, called up through the actuation of a corresponding switch by a user, for example a foot-operated switch **84**.
(28) In a respective operating mode, the operation of the electrosurgical generator **12** is controlled by a processor **70** in combination with an operating program **74** stored in the generator data memory **72**. The processor **70** generates—under the control of the operating program **74**—the maximum values for the different operating parameters, for example—such as the AC output voltage, the alternating output current, the output power, but also the DC voltage portion of the AC output voltage, wherein the respective current value of these parameters is detected during operation of the electrosurgical generator **12**.
(29) The processor **70** is connected to the generator data memory **72**, in which the operating program **74** for the electrosurgical generator **12** is stored.
(30) During execution of the operating program **74** stored in the generator data memory **72**, the processor **70** accesses, at locations stored in the operating program, operating specifications **76**, such as data representing values for operating parameters and/or control commands, which are stored in the generator data memory **72** for a respective operating mode. The operating specifications **76** specify, for example, specific values for the DC output voltage of the high-voltage power supply or the AC output voltage, the alternating output current of the high-frequency part, or similar data. However, operating specifications **76** stored in the generator data memory **72** also include specific control commands, such as "if" or "while", or "true" or "false". That way the data and control commands stored as operating specifications **76** can be combined by way of references in a data structure **78**, for example, into control instructions such as "compare the current value of the AC output voltage to the amount **200** and return "true" if the current value of the voltage is smaller than or equal to 200 and "false" if the current value is greater than 200".
(31) Other data and control commands can, for example, result in the control instruction that the maximum DC output voltage of the high-voltage power supply shall be 100 Volt.
(32) During operation, the processor **70** does not access the operating specifications **76** directly, but

calls up the data structure **78** at the respective points of the operating program; references referring to corresponding operating specifications **76** are stored for a respective operating mode in said data structure **78**; see e.g. FIG. **4**. The references may, for example, be numbers, in particular 1-byte binary numbers, since they require little memory space. In this case, the operating specifications **76** can be organized in the form of a table, in which each reference (i.e. for example each hexadecimal number) is assigned the corresponding control commands or data.

(33) A plurality of data sets **80** that each contain one reference or several references which, due to the structure of the respective data set—in particular the order in which the references are stored—can be assigned line numbers, are stored in the data structure **78**, so that different operating modes can be implemented. The line numbers can be addresses within the structured data of a data set, which the processor **70** can access under the control of the operating program. The references assigned to a line number refer to specific operating specifications **76** in the generator data memory **72** and cause the processor **70** to read the corresponding operating specifications from the generator data memory **72**, after the processor **70** has first accessed the vector address stored in the data structure **78** and designated by the associated line number. The operating specifications **76** may be control instructions, control commands or parameter values, which the operating program **74** is to apply at the respective point of the operating program where the operating program **74** contains a reference to a line number in the data structure **78**.

(34) References to operating specifications **76** in the generator data memory **72** are stored in the data structure **78** in an ordered sequence. The structure of a respective data set in the data structure **78** makes it possible to assign line numbers, like addresses, within the data structure **78** to the references so that, for example, jumps or returns to references in the data structure **78** are possible and not only a strictly sequential processing of the references by the operating program. The line numbers can serve as vector addresses within the structured data in the data structure **78**, which the processor **70** accesses under the control of the operating program. The references assigned to the line numbers refer to corresponding operating specifications in the generator data memory **72**. The operating specifications can be control specifications, namely e.g. individual control commands, composite control instructions, or parameter values. The control specifications control the operation of the electrosurgical generator **12** in the respective operating mode. The control specifications can also be control commands that cause other references in the data structure **78** to be called up. However, this is only possible within a data set with structured data, which data belongs to a respective operating mode.

(35) The parameterized references are preferably represented by hexadecimal numbers that, together, form structured data of a data set **80**. A data set belongs to an operating mode and can contain the following, for example:

(36) TABLE-US-00003 006F 11 0070 36 02 30 00 C8 00 0076 12 0077 0F 04 64 00 0078 56 007C 4B 03 02 007F 13

(37) The numbers shown in italics are line numbers that were generated while the data set **80** was being read and are not stored in the data memory **26** of the electrosurgical instrument **14**; instead, they are generated by the operating program itself in accordance with the order of the references in a corresponding data set. The line numbers are the result of the order of the references (i.e. their structure) in a respective data set. The line numbers represented in the example by the numbers shown in italics are simply numbers in ascending order in accordance with the length of the structured data. The numbers shown in bold serve as references (or pointers), each of which refers to a specific operating specification **76** in the generator data memory **72**, namely—in the illustrated example—to control commands. Thus, “11”, for example, refers to the control command “IF”, “36” refers to a comparison that is specified by the following assigned numbers “02 30 00 C8 00”, “12” refers to the control command “THEN”, “0F” refers to a control command for setting a parameter value specified by the following assigned numbers “04 64 00”, and “56” refers to the control command “ELSE”.

(38) The respective operating specification **76** called up by means of the parameterized reference also shows which additional information (such as “02 30 00 C8 00” in the example above) is also relevant.
(39) The operating program **74** can read and translate the example described above as follows:
(40) TABLE-US-00004 11-if -> no additional information required 36-comparison -> 5 characters of additional information required (02 = 1 character type of comparison, 30 00 = 2 characters number 1, C8 00 = 2 characters number 2) 12-then -> no additional information required 0F-set initial value -> 3 characters additional information (04 = 1 character which initial value; 64 00 = 2 characters set value) . . . Translated, this can mean ″Compare whether number 1 (30 00) is greater than number 2 (C8 00). If the result is TRUE, set voltage to 100 V (64 00), else . . .″
(41) The binary numbers shown in the example as hexadecimal numbers (and herein referred to in short as “hexadecimal numbers”) in a respective data set **80** thus represent first of all references, based on which the operating program **74** can access specific operating specifications **76** in the generator data memory **72**. The hexadecimal numbers stored in a data set in a structured (ordered) manner represent the aforementioned references to operating specifications **76** stored in the generator data memory **72**, such as control commands and parameters, which, due to the structure of the data set **80**, can be assigned line numbers that, as such, do not need to be explicitly stored in the data set **80**, but that can be generated by the operating program **74** during the import of a respective data set **80**.
(42) The binary numbers stored in a respective data set **80** and shown as hexadecimal numbers in the example serve as pointers, each of which refers to a specific operating specification **76** in the generator data memory **72** of the electrosurgical generator **12** so that the corresponding hexadecimal number (i.e. the reference in the structured data) is linked to a corresponding operating specification **76** in the generator data memory **72** of the electrosurgical generator **12**. Thus, these hexadecimal numbers are used to designate a corresponding operating specification **76** in the generator data memory **72** of the electrosurgical generator **12**. These hexadecimal numbers are therefore a kind of pointer for guiding the operating program to the operating specifications **76** in the generator data memory **72** of the electrosurgical generator **12**, where the operating program **74** can, during its execution, in each case call up an operating specification for the operating program **74**. The calling up of the references is controlled by the operating program **74**, resulting in the operating program **74** calling up those operating specifications **76** in the generator data memory **72** to which the references refer. Jumps within the references that are identified by their sequence or line numbers are also possible. Via the memory entries in the generator data memory **72** corresponding to it, the structured data in a data set **80** can thus be translated into specific operating specifications **76** for the operating program **74**.
(43) In the data set shown by way of example above, the entries in the first column (“006F, 0070, 0076 . . . ”) are the line numbers to which the operating program **74** can refer. The line numbers are not stored in the data memory **26** of the electrosurgical instrument **14**, but are generated by the operating program **74** itself, since the line numbers are simply numbers in ascending order in accordance with the length of the structured data: 0070 36 02 30 00 C8 00 (data length=6, i.e. the next address is 0076) 0076 12 (data length=1, i.e. the next address is 0077)
(44) The entries in each line (“11, 36 02 30 00 C8 00, 12 . . . ”) refer to positions of memory entries in the generator data memory **72** that contain operating specifications **76**. The entry in the generator data memory **72** labeled **11** may be an operating specification representing an “IF” instruction, for example, while the entry labeled **12** may be a “THEN” instruction. The “IF” instruction and the “THEN” instruction are each one operating specification. Based on the associated operating specifications **76** in the generator data memory **72**, the hexadecimal numbers “36 02 30 00 C8 00” that, in the structured data of the illustrated data set, are located between 11 and 12 can be translated into a control instruction, such as “Compare the last read value of the voltage (30 00) with the number 200 (C8 00) and return “TRUE” if the voltage is smaller than or equal to 200, else

return “FALSE”. When the operating program **74** calls up the memory entries for the string “0F 04 64 00” from the generator data memory **72** at the address “0077” (generated by the operating program **74**), this could denote a setting for the electrosurgical generator **12**; the setting may e.g. be that a maximum value for the DC output voltage (0F 04) is set to 100V (64 00).

(45) Thus, the operation of the electrosurgical generator **12** in a respective operating mode depends first of all on the operating program **74** stored in the generator data memory **72**. However, in addition, the operating behavior of the electrosurgical generator **12** in a respective operating mode also depends on the data set **80** in the data structure **78** called up for a respective operating mode as well as on the operating specifications **76** also stored in the generator data memory **72**.

(46) The advantage of such an electrosurgical generator **12** is that new operating modes can easily be defined by generating new data sets **80** in the data structure **78**, and that a single operating mode can, for example, be changed solely by changing the corresponding data set **80** in the data structure **78**, without the operating program **74** in the generator data memory **72** or the operating specifications **76** in the generator data memory **72** having to be changed. On the other hand, global parameters, such as any potential control instructions that might be available or operating parameters depending on the electrosurgical generator **12**, such as its maximum AC output voltage or a minimum permissible DC output voltage, can be stored as operating specifications **76** in the generator data memory **72**, where they can, if need be, also be changed centrally for all possible operating modes at once.

(47) Another advantage of the electrosurgical generator **12** is that a data set **80**, the structured data of which indirectly defines an operating mode suitable for the electrosurgical instrument **14**, can also be stored in an electrosurgical instrument **14**; see FIG. **5**. Specifically, the instrument data memory **26** of the electrosurgical instrument **14** can contain a data set **80** with structured data that is compatible with the data structure **78** and, just like other structured data in the data structure **78**, indirectly defines a respective operating mode by means of corresponding references to specific operating specifications **76** in the generator data memory **72**. For example, in the instrument data memory **26**, one or several data sets **80** with structured data are then stored in a read-only area, and status and usage data for a specific electrosurgical instrument **14** are stored in a read-write area.

(48) The electrosurgical generator **12** is configured in such a way that, when an electrosurgical instrument **14** is connected, the electrosurgical generator **12** will, in each case, first read the instrument data memory **26** of the electrosurgical instrument **14**—if available—and enter the structured data from the data set stored in the data memory **26** into the data structure **78**. Thus, an operating mode precisely tailored to the respective electrosurgical instrument **14** will be available to the electrosurgical generator **12** during operation. At the same time, the electrosurgical generator **12** also reads the status and usage data from the read-write area of the instrument data memory **26** of the electrosurgical instrument **14**.

(49) In order to allow access to the content of the instrument data memory **26** of the electrosurgical instrument **14**, at least the data line **22** with a corresponding connection **18**.**3** is provided. As an alternative or in addition, a wireless interface, such as a Bluetooth interface or an NFC interface, may be provided for accessing the content of the instrument data memory **26** of the electrosurgical instrument **14**.

(50) When the structured data is transferred from the instrument data memory **26** of the electrosurgical instrument **14** into a corresponding data set in the data structure **78** of the electrosurgical generator **12**, the line numbers specified by the structure of the structured data in the instrument data memory **26** can, if applicable, be generated to match the operating program of the electrosurgical generator **12**.

(51) It is a great advantage that the data set **80** stored in the read-only area of the instrument data memory **26** only contains references ordered in a structured manner (pointers to further memory entries **76** in the generator data memory **72**), but does not directly contain any control instructions or operating parameters for a respective operating mode since the control instructions and the

operating parameters are centrally stored as operating specifications **76** in the generator data memory **72** of the electrosurgical generator **12**.

(52) Alternatively, the electrosurgical generator **12** can also be configured such that it directly reads out the instrument data memory **26** of the electrosurgical instrument **14** during operation—i.e. during the execution of the operating program **74**. This is the case in the example shown in FIG. **5**. In this case, the structured data of the data set in the data memory **26** of the electrosurgical instrument **14** does not need to be transferred into the data structure **78** of the electrosurgical generator **12** first. However, the line numbers must match the corresponding call-ups in the operating program and the entries representing the operating specifications in the generator data memory **76** in this case. The electrosurgical generator **12** will preferably always read the status and usage data from the read-write area of the instrument data memory **26** right after an electrosurgical instrument has been connected to the electrosurgical generator **12**.

(53) An advantage of an electrosurgical system **10** of the type described herein is that different data that defines the operation of the electrosurgical generator **12** can be managed independently of one another. Thus, the operating program **74** stored in the generator data memory **72** is stored independently of the operating specifications **76** in the generator data memory **72**. Operating specifications **76** are, in turn, stored independently of the structured data in the data structure **78**.

(54) For programming the operating program **74**, the operating specifications **76** and the data structure **78** with the structured data, a programming interface **82** is provided that is preferably configured in such a way that it grants different rights to different users. Thus, different rights can be assigned for programming the operating program **74** that is stored in the generator data memory **72**, for entering the operating specifications **76** that are also stored in the generator data memory **72**, and for the structured data that is stored in the data structure **78** in the generator data memory **72** and/or in the instrument data memory **26**. This way, it can in particular be ensured that changes to the operating specifications **76** or changes to the operating program **74** can only be made by developers who are familiar with the respective electrosurgical generator **12**. The operating program **74** and the operating specifications **76** can thus be programmed by developers who are familiar with the respective electrosurgical generator **12**, while a developer who is familiar with the electrosurgical instrument **14** can define the operating modes for an electrosurgical instrument **14** by creating a corresponding data set **80** with structured data. Preferably, data sets created by a developer who is familiar with the electrosurgical instrument **14** are stored in the instrument data memory **26** of the respective electrosurgical instrument **14**, while further operating modes can also be stored directly in the data structure **78** on the electrosurgical generator **12**. To this end, the electrosurgical generator **12** can have a USB programming interface, for example.

(55) Either the data line **32** in the connecting cable **16** with a corresponding interface, or—as an alternative or in addition—a wireless interface, such as a Bluetooth interface or an NFC interface, is available for the structured data and status and usage data stored in the instrument data memory **26** of the respective electrosurgical instrument **14**. The structured data from the data set **80** as well as the status and usage data in the instrument data memory **26** of the electrosurgical instrument **14** can then be transferred into the data structure **78** of the electrosurgical generator when the electrosurgical instrument **14** is connected.

(56) This is, in particular, relevant with regard to different electrosurgical instruments **14**, since the electrosurgical instruments **14** might be integrated by other developers than the electrosurgical generator **12**. The developers of the electrosurgical generator **12** can store all the specific parameter data and control commands that are important for the electrosurgical generator **12**—if need be in dependence on the operating program **74** stored in the generator data memory **72**—as operating specifications in the generator data memory **72**. Such parameter values can, for example, be maximum or minimum permissible values for the DC output voltage, the AC output voltage, etc.

(57) Independently of this, developers of an electrosurgical instrument **14** can use the structured data in the data set in the instrument data memory **26** of the electrosurgical instrument to specify in

detail how a specific operating mode can be executed for this electrosurgical instrument **14** within the framework of the operating specifications **76** in the generator data memory **72** as read out by the operating program **24** in the generator data memory **72**. The developers of the electrosurgical instrument **14** do not need to give any further consideration to the operating program **74** and the potentially applicable operating specifications **76**. Instead, the developers of the electrosurgical instrument **14** can accept these operating specifications provided for the respective electrosurgical generator **12**.
(58) While the structured data in the read-only area of the instrument data memory **76** is already generated by a developer by means of a programming interface **82** during the manufacturing of the electrosurgical instrument, for example, the data stored in the read-write area of the instrument data memory **26** is preferably written to the instrument data memory **26** according to the data allocation table by the electrosurgical generator **12** after each use of the electrosurgical instrument **14**, and thus updated.
(59) A programming interface **82** is available to the developers of an electrosurgical instrument **14** for defining an operating mode for the respective electrosurgical instrument **14**, and for defining data to be exchanged with the electrosurgical instrument **14** and to be stored in the data memory **26** of the electrosurgical instrument **14**.
(60) Status and usage data stored in the read-write area of the electrosurgical instrument can be read by the electrosurgical generator when the electrosurgical instrument **14** is connected to the electrosurgical generator **12**, or during its operation. The reading of status and usage data is done using the data allocation table. The status and usage data is stored in the read-write area as a tag and value sequence (see Table 3: Sample data set for stored status and usage data). The electrosurgical generator **12** thus sequentially reads the read-write area of the instrument data memory **26** and first finds a tag (e.g. 0x01). According to the data allocation table, the electrosurgical generator **12** now knows how much data follows and which data it is (e.g. remaining ultrasound activations with a length of 1 byte). The electrosurgical generator **12** then finds another tag (e.g. 0x03). According to the data allocation table, the electrosurgical generator **12** now knows how much data follows and which data it is (e.g. supplied activation energy with a length of 2 bytes). This is repeated until the generator finds the end tag 0x00.
(61) TABLE-US-00005 TABLE 3 Sample data set for stored status and usage data Address in read-write Memory area content Description 0x0000 0x01 1st tag 0x01 = Subsequent data defines the remaining ultrasound activations; the length of the data is 1 byte (see data allocation table) 0x0001 0xff 1, data 0xff = 255 remaining ultrasound activations 0x0002 0x03 2nd tag 0x03 = Subsequent data defines the supplied activation energy; the length of the data is 2 bytes (see data allocation table) 0x0003 0xff 2nd data 0x0004 0xff 0xffff = 65535 mJ were supplied during the last activation 0x0005 0x00 3rd tag 0x00 = No further data
(62) Which status and usage data is to be stored is defined in the structured data in the instrument data memory **26** of the electrosurgical instrument **14**. For this purpose, specific parameterizable references are available for storing status and usage data. An example for writing the remaining ultrasound activations as well as the supplied activation energy can be found in Table 4: Example for defining status and usage data to be written. The column “Resulting structured data” is inserted at the appropriate place into the structured data defining the operating mode and finally stored in the read area of the electrosurgical instrument.
(63) TABLE-US-00006 TABLE 4 Example for defining status and usage data to be written Resulting Reference Parameter 1 Parameter 2 structured data Write to RTOU 255 0x4D 0x01 0xFF instrument Write to Activation 65535 0x4D 0x03 0xFF instrument energy 0xFF
(64) The data to be exchanged with the electrosurgical instrument **14** and stored in the data memory **26** of the electrosurgical instrument **14** can thus be defined via the programming interface **82** (see FIG. **1**) and finally stored in the read-write area as a sequence of identifier (tag) and value. Table 5 below shows an example:

(65) TABLE-US-00007 TABLE 5 Sample data set with stored usage and status data (in italics) Partition Data Description Read-write *0x01 Tag 0* (*0x01 = 1-byte counter ultrasound* area *activations*) *0xff Data 0* (*0xff = 255 ultrasound activations left*) *0x03 Tag 1* (*0x03 = 2 bytes activation energy*) *0xffff Data 1* (*0xffff = 65535 mJ*) *0x00 Tag 2* (*0x00 = 0 byte no data*)
(66) The sum of the data determines the size of the read-write area and is finally stored in the configuration area (Config Area) during programming and partitioning of the instrument data memory **26** of the electrosurgical instrument **14**. The electrosurgical generator **12** can read the data of the read-write area. The identifiers (tags) define which data the electrosurgical generator **12** should read and process and which data it should update.
(67) Via the programming interface **82**, a developer can define the data to be exchanged between and stored in the electrosurgical generator **12** and the electrosurgical instrument **14**. FIG. **6** shows an example of a definition of usage and status data by means of the programming interface **82**.
(68) Via the programming interface **82**, a developer can also fully define an operating mode for a respective electrosurgical instrument **14**. This definition includes, for example, all current and voltage parameter values as well as timing specifications and transition conditions for the operation of the electrosurgical instrument. Thus, the operating mode can be developed with the aid of an easy-to-use tool virtually without any software development knowledge by a developer for an electrosurgical instrument. The programming interface **82** provides to the developer a number of parameter sets that the developer can use to define different phases, for example the initial incision phase, the cutting phase, the coagulation phase, but also short-circuit or power monitoring for the respective electrosurgical instrument. A development tool belonging to the programming interface **82** generates a memory space-saving set of structured data from the specifications, wherein said set of data forms a data set that can be stored in the data memory **26** of the electrosurgical instrument **14** in a non-volatile manner.
(69) If a new operating mode for an electrosurgical instrument defined by structured data in a data set **80** also requires a change of the operating program **74** in the generator data memory **72** or of the operating specifications **76** in the generator data memory **72**, such changes can, for example, be made by a developer who is familiar with the electrosurgical generator **12** via a programming interface **82**. This way it can be ensured that the structured data that defines an operating mode is compatible with the operating specifications **76** in the generator data memory **72** and the operating program **74** in the generator data memory **72**. The developer of the electrosurgical instrument can consult the developer familiar with the electrosurgical generator in this regard. As a result, it is ensured that a developer who is not familiar with the electrosurgical generator—e.g. a developer for an electrosurgical instrument—cannot create erroneous operating specifications or change the operating program in a way that causes unintended effects or errors.
(70) When an electrosurgical instrument **14** is connected to the electrosurgical generator **12**, the electrosurgical generator **12** reads the instrument data memory **26** in the electrosurgical instrument **14** and interprets the structured data in the data set **80** stored therein using the operating specifications **76** in the generator data memory **72**, so that the current and voltage curves including any timing requirements and other conditions defined in those operating specifications **76** are applied. This allows for reduced development times and costs. For the most part, the electrosurgical instrument **14** can be integrated independently of an electrosurgical generator **12**. In addition, this allows for a shorter time-to-market, since the operating modes can also be developed and finalized after the introduction of an electrosurgical generator **12**. Optimizations of an operating mode and new operating modes can be easily introduced by means of updated or new electrosurgical instruments **14**. An operating mode for an electrosurgical instrument can be defined with almost no software development knowledge.
(71) If the electrosurgical system **10** is to be operated with an electrosurgical instrument **14** connected to the electrosurgical generator **12**, the appropriate operating mode will already be available once the electrosurgical instrument **14** has been connected, since the associated data sets

80 with the structured data can be read by the instrument data memory **26** of the electrosurgical instrument **14**. Therefore, a user will, for example, only have to actuate a switch **84**, in order to operate the electrosurgical instrument **14** in the appropriate operating mode of the electrosurgical generator **12**. After connecting the electrosurgical instrument **14**, the user does not need to set or program anything.

(72) The switch **84** is functionally connected to the processor **70** of the electrosurgical generator **12** via a line **86**, so that the execution of the operating program **74** stored in the generator data memory **72** can be started and stopped through the actuation of the switch **84**. The switch **84** may be a foot-operated switch, but may also be a hand-operated switch, that is, for example, located on the electrosurgical instrument **14**. A wireless control connection can be provided instead of the line **86**.

(73) Another alternative to a switch **84** is an automatic start of the operating program, which a user can activate in advance. In this case, the electrosurgical instrument first outputs a small measurement voltage in order to detect tissue contact (current flow) with the aid of said measurement voltage. If tissue contact—i.e. current flow—is detected, the actual operating program for the electrosurgical instrument will be called up. If the tissue contact disappears, the actual operating program for the electrosurgical instrument will be ended, and a small measurement voltage will once again be output so that a new tissue contact can be detected with the aid of said measurement voltage.

(74) Under the control of the operating program **74**, the processor **70** indirectly accesses individual operating specifications **76** in the generator data memory **77** during the use of an operating mode by first accessing the references in the data structure **78** and subsequently calling up the operating specification or operating specifications referred to by the respective reference.

(75) Depending on the content of the generator data memory **72** and on the data structure **78** as well as on signals **90** coming from the detection units **54**, **56** and **58**, the processor **70** generates control signals **88** for the generator control unit **46**.

REFERENCE NUMBERS

(76) **10** electrosurgical system **12** electrosurgical generator **14** electrosurgical instrument **16** connecting cable **18.1**, **18.2** electrical outputs **18.3** connection **20** shaft **20.1**, **20.2** outputs **22** active electrode **24** handle **26** instrument data memory **28**, **30** supply lines **32** data line **40** high-voltage power supply **42** output **44** high-frequency part **46** output transformer **48** generator control unit **50** capacitor **52** synchronizing circuit **54** output current detection unit **56** AC output voltage detection unit **58** DC output voltage detection unit **60** high-voltage rectifier circuit **62** output capacitor **64** switch **70** processor **72** generator data memory **74** operating program **76** operating specifications **78** data structure **80** data set **82** programming interface **84** switch **86** line **88** control signals of the processor **90** signals of the detection units

Claims

1. Electrosurgical system comprising an electrosurgical instrument, having an instrument data memory and a connection for a connecting cable or a connected connecting cable, which includes supply lines for supplying a high-frequency alternating current required for an electrosurgical treatment to at least one active electrode, and at least one data line for reading data from the instrument data memory and for writing data to the instrument data memory, wherein the instrument data memory has at least one read-write area where status and usage data is modifiably stored by an electrosurgical generator using a data allocation table that defines a structure of the read-write area, and an electrosurgical generator, to which the electrosurgical instrument is connected, wherein the electrosurgical generator has a processor and at least one generator data memory where first data is stored that defines an operating program for controlling the operation of the electrosurgical generator in conjunction with the electrosurgical instrument; second data is stored that represents operating specifications that can be called up by the operating program and

influence the operation of the electrosurgical generator, but which does not define any fixed operating sequences; third data is stored that forms a data structure with data sets with stored structured data that contains references to operating specifications stored in the generator data memory, which allow for calling up individual references in a targeted manner by the operating program during operation; and fourth data is stored that forms a data allocation table for a read-write area of the instrument data memory of the electrosurgical instrument to be connected to the electrosurgical generator during operation, wherein the operating specifications and the data structure are provided independently of each other, and wherein the processor of the electrosurgical generator indirectly accesses individual operating specifications, while the operating program is running, by first accessing references in the data structure and subsequently retrieving an operating specification or those operating specifications to which a respective reference refers, and the data structure is read from the instrument data memory.

2. Electrosurgical system according to claim 1, wherein the data structure is formed by the content of a read-only area of the instrument data memory of the electrosurgical instrument.

3. Electrosurgical system according to claim 1, wherein the processor of the electrosurgical generator is configured, in combination with the operating program, to read or write to the instrument data memory of the electrosurgical instrument.

4. Electrosurgical system according to claim 1, wherein the processor of the electrosurgical generator is configured by the operating program to read the instrument data memory of the electrosurgical instrument while the operating program is running.

5. Electrosurgical system according to claim 1 further comprising one programming interface or several programming interfaces, by means of which the content of the generator data memory and of the data structure can be programmed.

6. Electrosurgical instrument for an electrosurgical system, wherein the electrosurgical instrument comprises at least one active electrode for effecting an electrosurgical treatment, an instrument data memory, and a connection for a connecting cable or a connected connecting cable, which features supply lines for supplying a high-frequency alternating current required for an electrosurgical treatment to the active electrode, and at least one data line for reading data from the instrument data memory and for writing data to the instrument data memory, wherein the instrument data memory has at least one read-write area where status and usage data is modifiably stored by an electrosurgical generator using a data allocation table that defines the structure of the read-write area, wherein the instrument data memory is partitioned and features a first partition making up a read-write area and a second partition making up a read-only area, and wherein the data sets with structured data are stored in the partition of the instrument data memory that makes up the read-only area.

7. Electrosurgical instrument according to claim 6, wherein the instrument data memory contains data sets with structured data, said data containing references to operating specifications stored in a generator data memory of an electrosurgical generator.

8. Electrosurgical instrument according to claim 6, wherein the instrument data memory of the electrosurgical instrument is configured in such a way that an electrosurgical generator can, while the electrosurgical instrument is in operation, write usage and status data regarding the electrosurgical instrument into a partition of the data memory that makes up the read-write area.

9. Electrosurgical instrument according to claim 6, wherein the instrument data memory is a non-volatile memory.

10. Electrosurgical instrument according to claim 6, wherein the electrosurgical instrument is a hand-held instrument with a handle and a shaft upon which the active electrode is arranged.

11. Electrosurgical instrument according to claim 10, wherein the instrument data memory is located in the handle of the electrosurgical instrument.

12. Electrosurgical generator for an electrosurgical system, comprising connections for connecting an electrosurgical instrument for the electrosurgical system, wherein the electrosurgical instrument

has at least one active electrode for effecting an electrosurgical treatment, with an instrument data memory and with a connection for a connecting cable or a connected connecting cable, which features supply lines for supplying a high-frequency alternating current required for an electrosurgical treatment to the active electrode, and at least one data line for reading data from the instrument data memory and for writing data to the instrument data memory, wherein the instrument data memory has at least one read-write area where status and usage data is modifiably stored by an electrosurgical generator using a data allocation table that defines a structure of the read-write area, and the electrosurgical generator having a processor and at least one generator data memory, which contains an operating program for controlling the operation of the electrosurgical generator in conjunction with the electrosurgical instrument; contains operating specifications that can be called up by the operating program and influence the operation of the electrosurgical generator, but which do not define any fixed operating sequences; contains a data structure with data sets with structured data that contains references to operating specifications stored in the generator data memory; and contains a data allocation table for a read-write area of an instrument data memory of an electrosurgical instrument to be connected to the electrosurgical generator during operation; wherein the processor is configured, in combination with the operating program, to write usage and status data regarding the electrosurgical instrument, when the electrosurgical instrument is in operation, into a partition making up the read-write area of the instrument data memory, and wherein the operating specifications and the data structure are provided independently of each other, and wherein the processor of the electrosurgical generator indirectly accesses individual operating specifications, while the operating program is running, by first accessing references in the data structure and subsequently retrieving an operating specification or those operating specifications to which a respective reference refers, and the data structure is read from the instrument data memory.
13. Method for operating an electrosurgical system according to claim 1, wherein the electrosurgical generator writes usage and status data regarding the electrosurgical instrument, when the electrosurgical instrument is in operation, into a partition of the data memory that makes up the read-write area.
14. Method according to claim 13, wherein, after connection and prior to the use of an electrosurgical instrument, the data structure and status and usage data are read from the data memory of the electrosurgical instrument, and data sets with structured data contained in the data structure on the electrosurgical instrument are transferred to a data structure that is stored on an electro-surgical generator.