(12) UK Patent Application (19) GB (11) 2594509 (13) A

(43) Date of A Publication 03.11.2021

(21) Application No: 2006417.6

(22) Date of Filing: 30.04.2020

(51) INT CL:
A61B 18/12 (2006.01)

(56) Documents Cited:
GB 2582318 A US 20200078111 A1

(58) Field of Search:
INT CL **A61B**
Other: **WPI, EPODOC, Patent Fulltext**

(71) Applicant(s):
Gyrus Medical Limited
(Incorporated in the United Kingdom)
Fortran Road, St Mellons, CARDIFF, CF3 0LT,
United Kingdom

(72) Inventor(s):
Mathew Swaffield
Richard John Hoodless

(74) Agent and/or Address for Service:
Withers & Rogers LLP
2 London Bridge, London, SE1 9RA, United Kingdom

(54) Title of the Invention: **Electrosurgical system with customised control**
Abstract Title: **Electrosurgical system with customised control**

(57) An electrosurgical system 100 for controlling an electrosurgical instrument 103 can be configured by a user via a user interface 101e touchscreen to split the control functions between a plurality of control devices, such as across both a handpiece 102 with control buttons and a footswitch 104 with pedal controls, such that each control device is configured to exclusively control a function of the electrosurgical instrument, such as RF electrosurgery or mechanical shave functions. Pre-sets of assignments of control functions may be stored for multiple users. The system may be configured to operate in an automatic priority mode in which the last control device to be connected to the generator is automatically selected first by the generator for assignment of control functions.

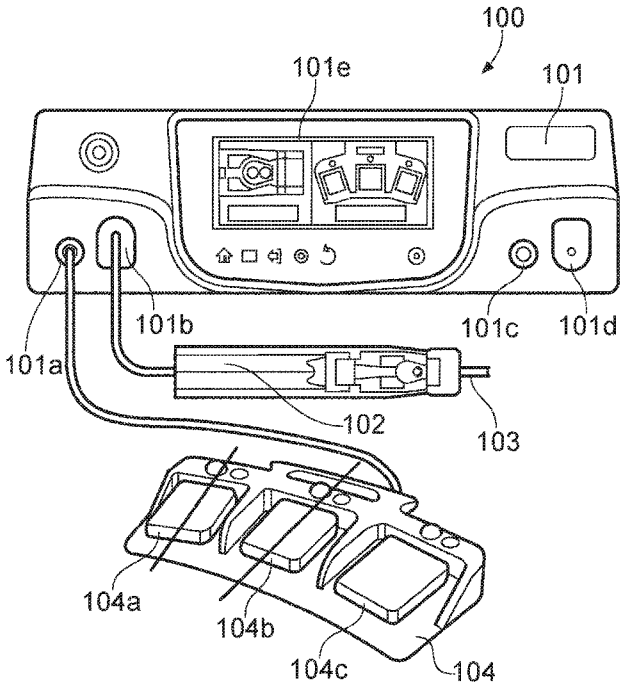

FIG. 4a

GB 2594509 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

01 02 21

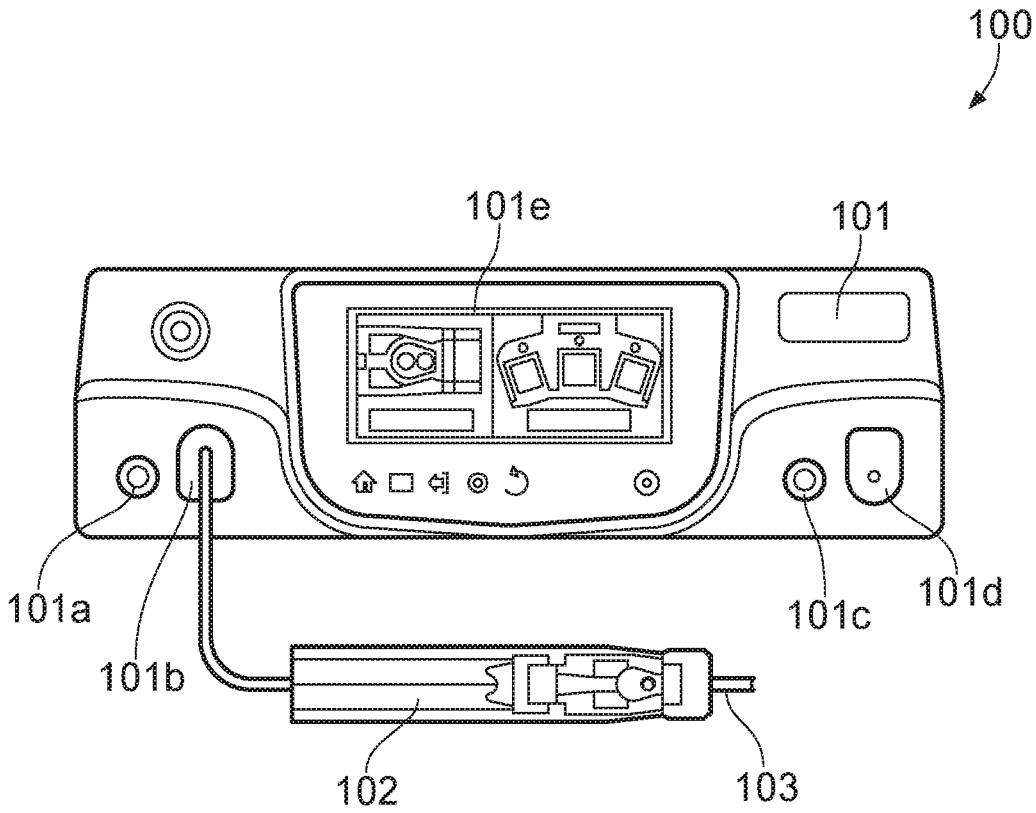

FIG. 1

01 02 21

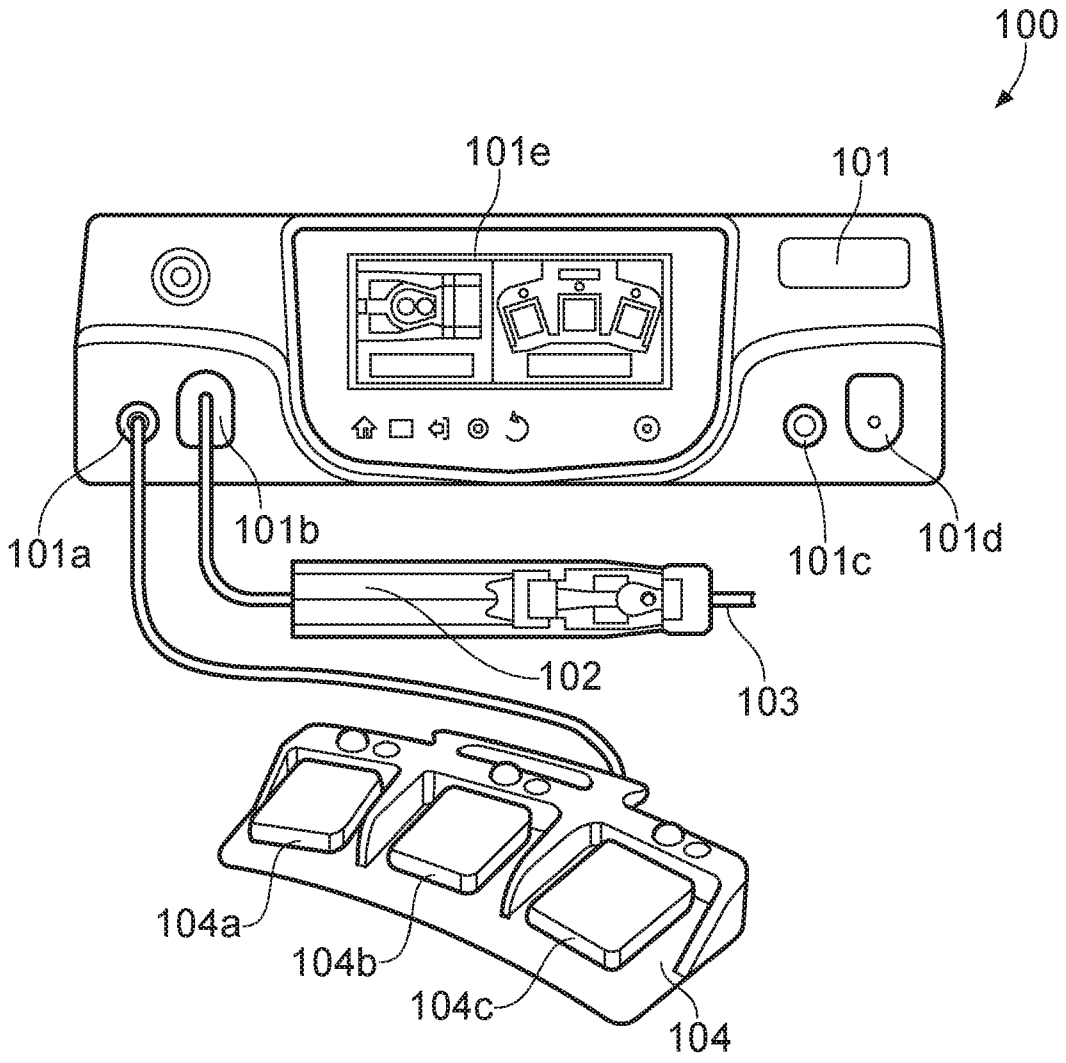

FIG. 2

01 02 21

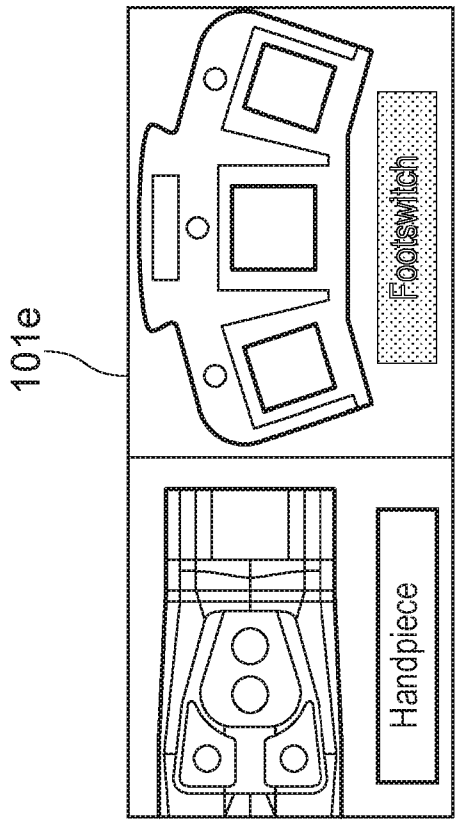

FIG. 3b

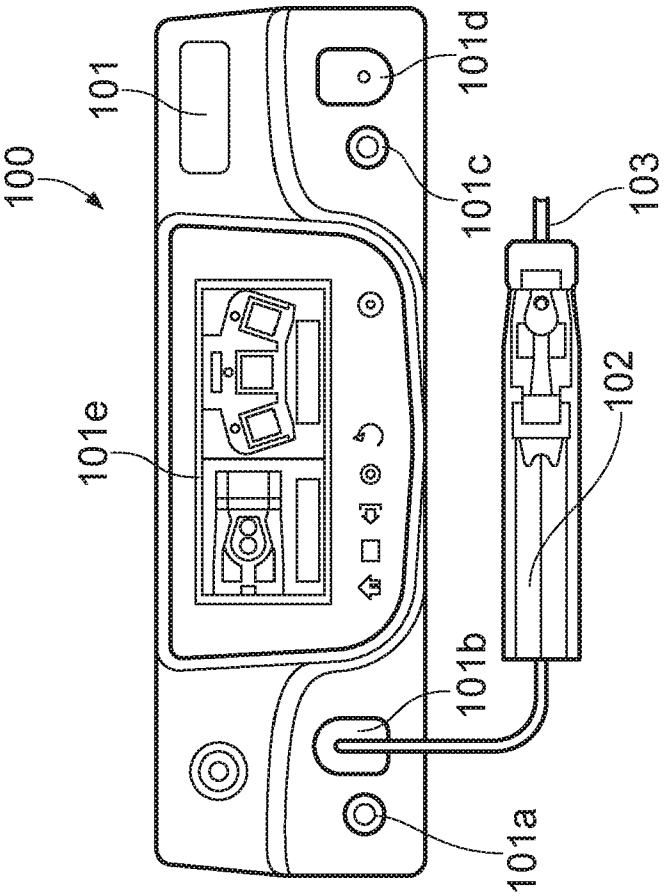

FIG. 3a

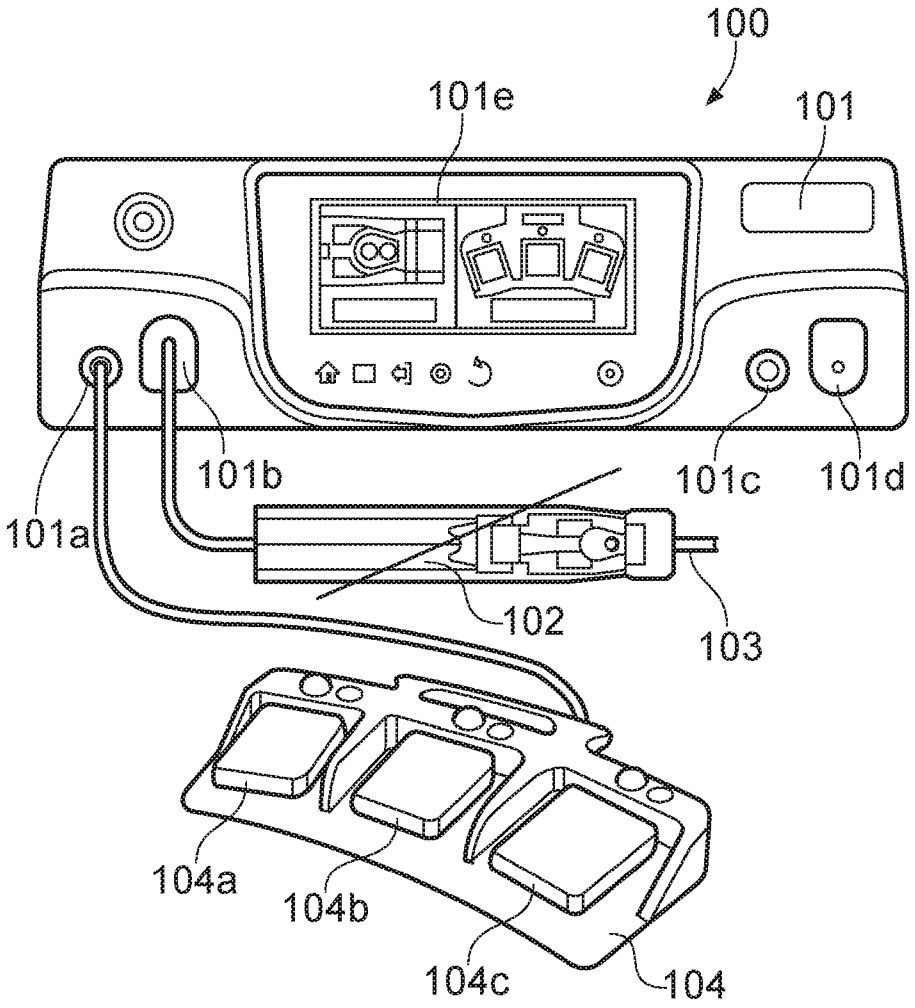
100
101e
101
101a
101b
101c
101d
102
103
104a
104b
104c
104

FIG. 3c

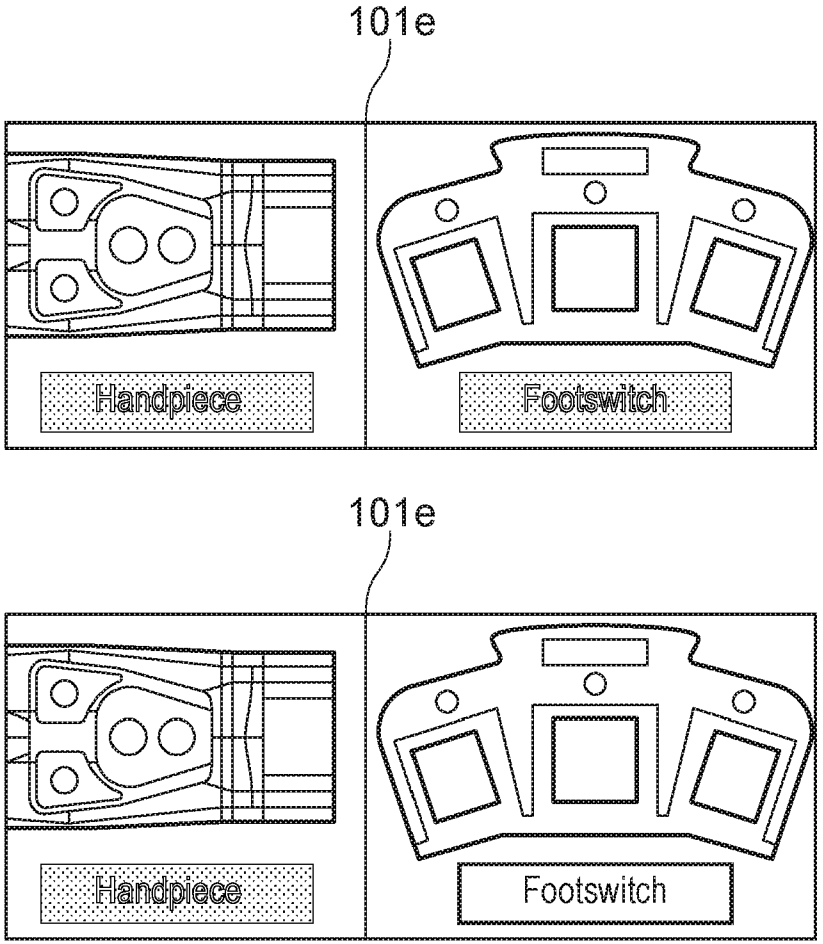
101e
Handpiece
Footswitch
101e
Handpiece
Footswitch

FIG. 3d

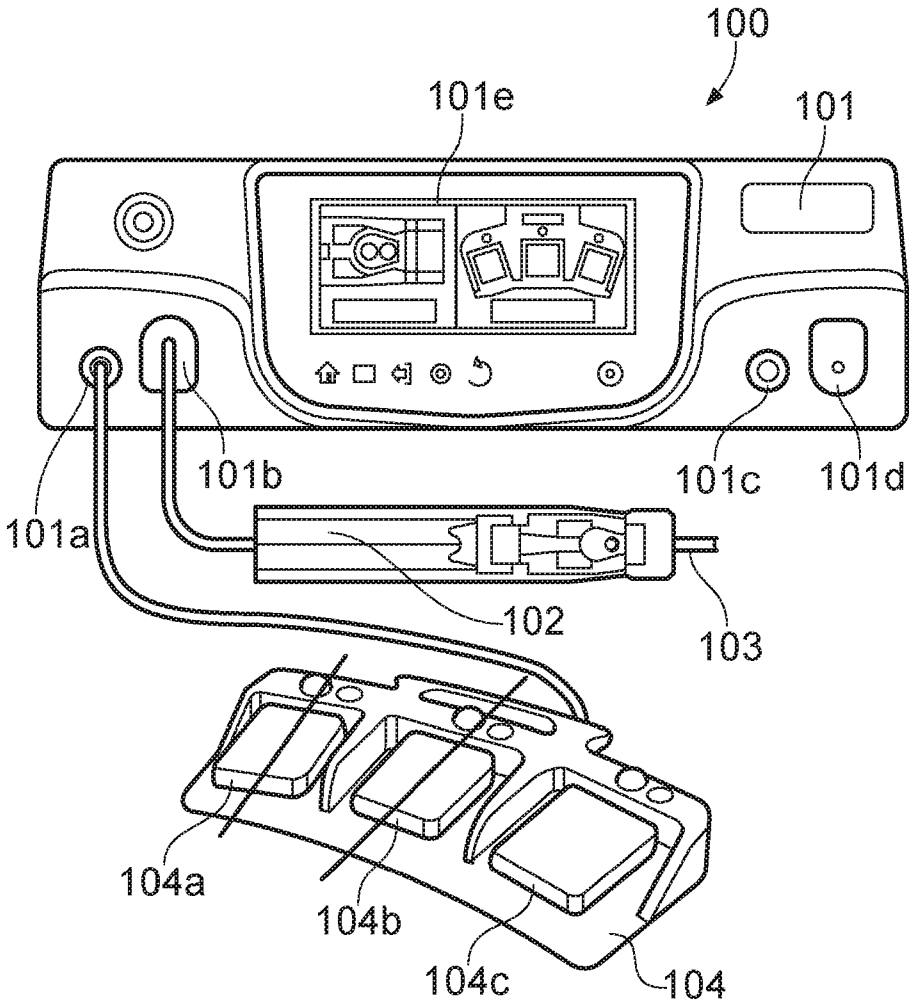
100
101e
101
101a
101b
101c
101d
102
103
104a
104b
104c
104

FIG. 4a

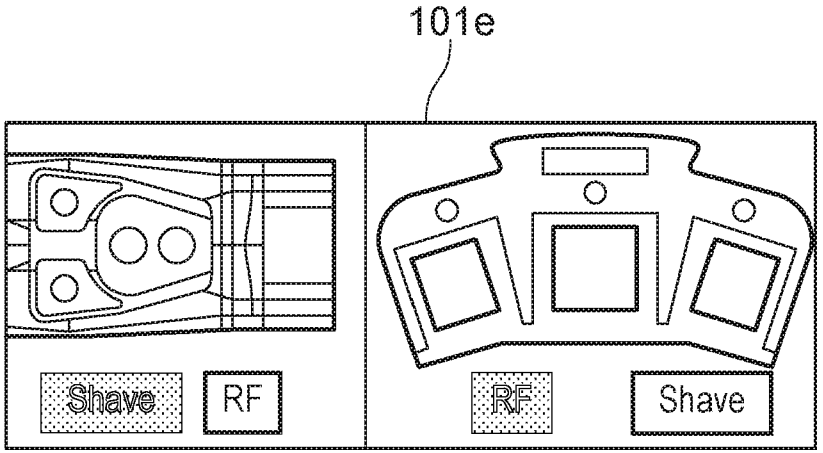
101e
Shave
RF
RF
Shave

FIG. 4b

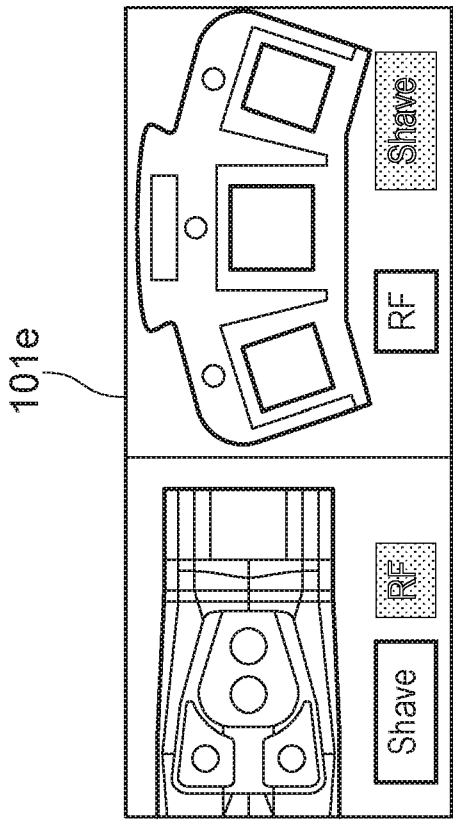

FIG. 4d

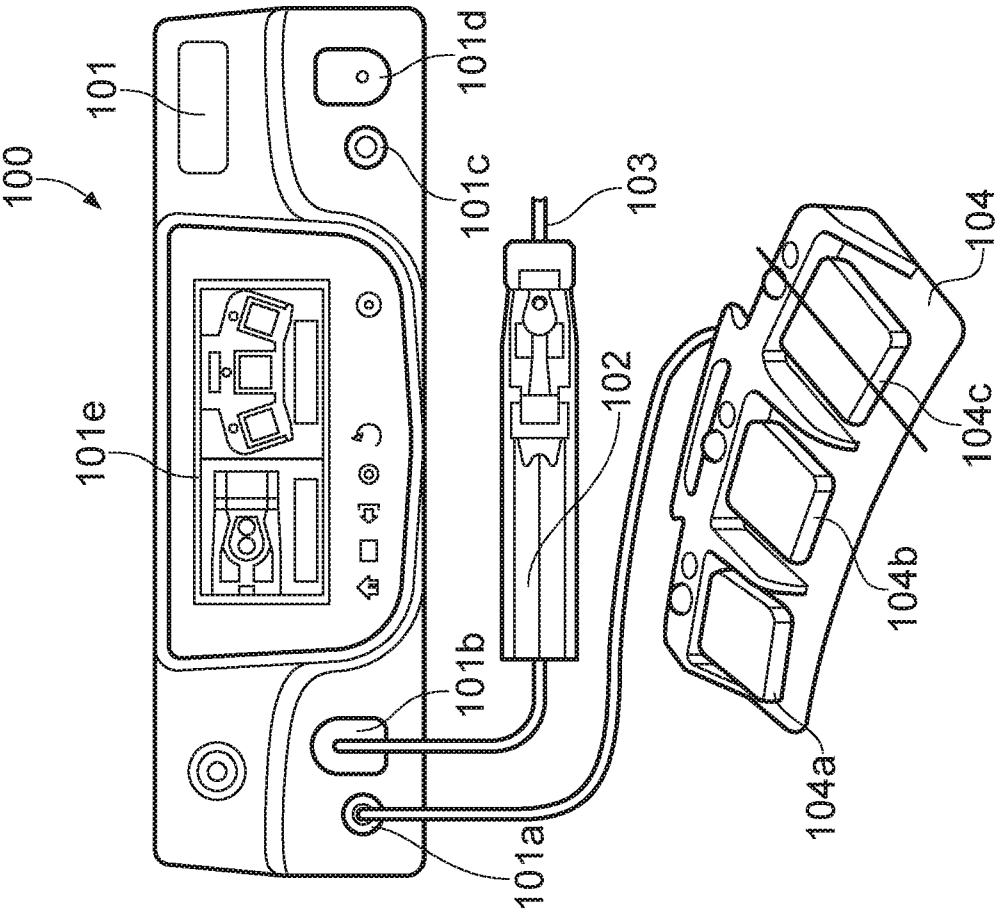

FIG. 4c

ELECTROSURGICAL SYSTEM WITH CUSTOMISED CONTROL

FIELD OF DISCLOSURE

The present disclosure relates to an electrosurgical system for controlling an electrosurgical instrument and in particular, to an electrosurgical system which can be configured, by a user, to split control functions between a plurality of control devices such that each device is configured to control exclusively a function of an electrosurgical instrument.

BACKGROUND

Electrosurgical instruments provide advantages over traditional surgical instruments in that they can be used for coagulation and tissue sealing purposes. One such prior art arrangement is known from US 5,904,681, which describes a surgical instrument including a mechanical cutting portion, such as a rotary blade or burr, and a radio frequency (RF) cutting and/or cauterizing portion comprising an electrosurgical instrument which operates in bipolar mode.

An electrosurgical instrument or electrosurgical device can be controlled by an external driver or generator. EP 2,578,172 discloses a generator to generate a drive signal to a surgical device. The generator includes an ultrasonic generator module to generate a first drive signal to drive an ultrasonic device, an electrosurgery/radio frequency (RF) generator module to generate a second drive signal to drive an electrosurgical device, and a footswitch coupled to each of the ultrasonic generator module and the electrosurgery/RF generator module. The footswitch is configured to operate in a first mode when the ultrasonic device is coupled to the ultrasonic generator module and the footswitch is configured to operate in a second mode when the electrosurgical device is coupled to the electrosurgery/RF generator module. The generator further includes a user interface to provide feedback in accordance with the operation of any one of the ultrasonic device and the electrosurgical device in accordance with a predetermined algorithm.

SUMMARY OF DISCLOSURE

Embodiments of the present invention provide an improved electrosurgical system for controlling the functions of an electrosurgical instrument connected to the electrosurgical system via a handpiece. The electrosurgical instrument is capable of different operations, including mechanical cutting of tissue, and electrosurgical ablation, sealing and/or

coagulation of tissue, with mechanical cutting and electrosurgical ablation, sealing or coagulation of tissue capable of taking place simultaneously.

The said operations or functions of the electrosurgical instrument can be controlled by the handpiece which holds the electrosurgical instrument, a footswitch or a combination of both. Users often have an inherent preference for controlling the electrosurgical instrument using a handpiece or footswitch based on the user's experience, training or current system used.

The inventors have recognised that it is also possible that the users require a split of the RF electrosurgery and mechanical shaving functions between the handpiece and the footswitch, such that each of the handpiece and the footswitch controls a dedicated function of the electrosurgical instrument. The inventors have recognised the need for an improved electrosurgical system which allows for the different control combinations to be accessed in a safe and effective way for any given user.

According to an aspect of the invention, an electrosurgical system comprises an electrosurgical generator having a user interface, the electrosurgical generator operable to configure, via the user interface, a plurality of control devices connected, in use, to the generator, wherein the electrosurgical generator is operable in a first mode to assign, via the user interface, respective control functions to each of the plurality of control devices such that each device is configured to exclusively control a function of an electrosurgical instrument connected to the electrosurgical generator; the system further comprising a handpiece for holding the electrosurgical instrument, wherein the handpiece is one of the plurality of control devices connected, in use, to the electrosurgical generator.

Advantageously, the electrosurgical system of the present invention enables a user to assign respective control functions to a plurality of control devices in a single configuration mode. This is an improvement over prior art systems which only enable one control device to be selected for assigning control functions to the selected control device. A key advantage of the electrosurgical system of the present invention is that the control functions can be split between multiple control devices, thereby enabling a user to use a combination of control devices, for example a handpiece and a footswitch, for controlling an electrosurgical instrument.

According to another aspect of the invention, a method of operating an electrosurgical system for controlling an electrosurgical instrument is provided, the method comprising: selecting, via a user interface on an electrosurgical generator, a first mode of operation

for the electrosurgical generator; assigning, via the user interface on the electrosurgical generator, respective control functions to each of a plurality of control devices connected to the electrosurgical generator such that each control device is configured to exclusively control a function of an electrosurgical instrument connected to the electrosurgical generator via a handpiece.

According to a further aspect of the invention an electrosurgical instrument for use in the electrosurgical system of the invention is provided, wherein the electrosurgical instrument is configured to perform at least one of an electrosurgery function and a shaving function.

BRIEF DESCRIPTION OF THE DRAWINGS

The teachings of this disclosure will be discussed, by way of non-limiting examples, with reference to the accompanying drawings, in which:

Figure 1 shows an embodiment of an electrosurgical system according to the present invention.

Figure 2 shows another embodiment of an electrosurgical system according to the present invention.

Figure 3a shows an illustrative example of a basic mode of operation for the electrosurgical generator of an electrosurgical system with only the handpiece connected to the electrosurgical generator.

Figure 3b shows the display on the user interface for basic mode of operation of the electrosurgical system of Figure 3b.

Figure 3c shows an illustrative example of a basic mode of operation for the electrosurgical generator of an electrosurgical system with a handpiece and a footswitch connected to the electrosurgical generator wherein the footswitch selected.

Figure 3d shows the display on the user interface for the basic mode of operation for the electrosurgical generator of the electrosurgical system of Figure 3c.

Figure 4a shows an implementation of an electrosurgical system comprising a electrosurgical generator in an advanced mode of operation according to the present invention.

Figure 4b shows the display of the user interface for the advanced mode of operation for the electrosurgical generator of electrosurgical system of Figure 4a.

Figure 4c shows another implementation of an electrosurgical system comprising a electrosurgical generator in an advanced mode of operation according to the present invention.

Figure 4d shows the display of the user interface for the advanced mode of operation for the electrosurgical generator of the electrosurgical system of Figure 4c.

DETAILED DESCRIPTION

An electrosurgical instrument can be used to perform different operations, including mechanical cutting of tissue, and RF electrosurgical ablation, sealing and/or coagulation of tissue, with mechanical cutting and RF electrosurgical ablation, sealing or coagulation of tissue capable of taking place simultaneously.

Embodiments of the present invention relate to the improvement of an electrosurgical system 100 for controlling an electrosurgical instrument as described above. Figure 1 shows an embodiment of an electrosurgical system 100 according to the present invention. The electrosurgical system comprises an electrosurgical generator 101. The electrosurgical generator 101 comprises inputs (101a-d) for connecting control devices. The electrosurgical generator 101 comprises a graphical user interface 101e, which may be, for example, a touch screen. The electrosurgical system comprises a handpiece 102 connected to the electrosurgical generator. The handpiece 102 is configured to hold the electrosurgical instrument 103 for use in treating a patient. The handpiece 102 is always connected to the electrosurgical generator 101 in operation, although it is disconnectable therefrom to allow other types of electrosurgical handpiece or electrosurgical instrument to be connected to the electrosurgical generator. The handpiece 102 comprises control buttons (not shown) for controlling RF electrosurgery and mechanical shaving functions of the electrosurgical instrument 103.

As shown in Figure 2, the electrosurgical system 100 may optionally comprise a footswitch 104. The footswitch 104 can be connected to the electrosurgical generator 101 during operation and can also be used to control a function of the electrosurgical instrument 103. The footswitch 104 comprises controls (104a-c), for example, pedals (104a-c) for

controlling RF electrosurgery and mechanical shaving functions of the electrosurgical instrument 103.

Figures 3a-3d are illustrative examples of a basic mode of operation of the electrosurgical system 100. The basic mode of operation is accessed via a menu in the user interface 101e.

As seen in Figure 3a, in a first implementation of the basic mode of operation, if only a handpiece 102 is connected, then only the handpiece controls are used for controlling the electrosurgery and mechanical shave functions of the electrosurgical instrument 103. This basic mode of operation would be preferred, for example, by a handpiece trained user. In this case, there is no selection choice of control devices because only the handpiece 102 is connected to the electrosurgical generator 101. In this case, as shown in Figure 3b, the user interface 101e would display, by default, that the handpiece 102 has been recognised.

Figure 3c is an illustrative example of another implementation of the basic mode of operation of the electrosurgical system, where both the handpiece 102 and footswitch 104 are connected to the electrosurgical generator 101. In this case also, the user has accessed the basic mode of operation via a menu in the user interface 101e. In the basic mode of operation, the user first selects a control device 102 or 104. As seen in Figure 3d the control information on the user interface 101e would be greyed out or blocked until the control device, in this case, the footswitch 104 is selected. The user then assigns, via the user interface 101e, control functions to the selected control device.

Figures 4a-d show an electrosurgical system 100 according to an embodiment of the present invention. In particular, these figures show an implementation of an advanced mode of operation as provided by the user interface 101e.

As shown in Figures 4a, 4c, the electrosurgical system 100 has both the handpiece 102 and footswitch 104 connected to the electrosurgical generator 101. The user interface 101e in this case is configured to have an advanced mode of operation. The advanced mode of operation is accessed via a menu on the user interface 101e. The advanced mode of operation is an improvement over the basic mode of operation explained earlier. The advanced mode of operation enables a user to configure the electrosurgical generator for assigning control functions to a plurality of control devices connected to the electrosurgical generator 101, in this case, to both the handpiece 102 and the footswitch 104 (see Figures 4c, 4d). In particular, the advanced mode of operation enables the user to customise a split of control functions, for example, a split of the RF electrosurgery and mechanical

shaving functions, across both the handpiece 102 and the footswitch 104, such that each control device is configured to exclusively control a function of the electrosurgical instrument 103.

Figure 4a shows a first implementation of the advanced mode of operation. In this case both the handpiece 102 and the footswitch 104 are connected to the electrosurgical generator 101. The user enters the advanced mode of operation via a menu on the user interface 101e. In this configuration, as shown in Figure 4b, the user assigns, via the user interface, only RF electrosurgery controls to the handpiece 102 and only mechanical shaving controls to the footswitch 104. This assignment locks out or disables mechanical shaving controls on the handpiece 102 and locks out or disables RF electrosurgery controls on the footswitch 104. That is, the handpiece 102 is now configured to control only the RF electrosurgery function of the electrosurgical instrument 103, whereas the footswitch 104 is configured to control only the mechanical shaving function of the electrosurgical instrument 103.

Figure 4c shows a second implementation of the advanced mode of operation. In this case both the handpiece 102 and the footswitch 104 are connected to the electrosurgical generator 101. The user enters the advanced mode of operation via a menu on the user interface 101e. In this configuration, as shown in Figure 4d, the user assigns via the user interface 101e only mechanical shave controls to the handpiece 102 and only RF electroshaving controls to the footswitch 104. This assignment locks out or disables RF electrosurgery controls on the handpiece 102 and mechanical shaving controls on the footswitch 104. That is, the handpiece 102 is now configured to control only the mechanical shaving function of the electrosurgical instrument 103, whereas the footswitch 104 is configured to control only the RF electrosurgery function of the electrosurgical instrument 103.

In a further embodiment, where there are multiple users using the electrosurgical system, the advanced mode of operation may also enable the storing of user presets with corresponding assignments of control functions to the control devices as defined by the respective user.

In another embodiment, the selection of the customised RF electrosurgery and mechanical shaving split controls could be controlled by a mode button or function from the handpiece or footswitch.

In another embodiment, the customisation of control functions, as enabled by the advanced mode of operation, could allow for full lock out or disabling of one function of the electrosurgical instrument – for example, a full lock out of RF electrosurgery or a full lock out of mechanical shaving. This may be particularly useful in the case where a user wishes to avoid accidental activation of the locked out function, such as near sensitive parts of the operated area.

In another embodiment of the invention, the electrosurgical system 100 is configured to operate in an automatic priority mode, wherein the last control device to be connected to the electrosurgical generator 101 takes priority when it comes to selecting a control device for assignment of control functions. For example, in the case of a handpiece 102 being already connected to the control device 101 and footswitch 104 subsequently connected to the electrosurgical generator device 101, the footswitch 104 is automatically selected first by the electrosurgical generator 101 for assignment of control functions.

It will be appreciated that various modifications, whether by way of addition, deletion and/or substitution, may be made to all of the above described embodiments to provide further embodiments, any and/or all of which are intended to be encompassed by the appended claims.

Claims

1. An electrosurgical system comprising:

an electrosurgical generator having a user interface, the electrosurgical generator operable to configure, via the user interface, a plurality of control devices connected, in use, to the electrosurgical generator,

wherein the electrosurgical generator is operable in a first mode to assign, via the user interface, respective control functions to each of the plurality of control devices such that each device is configured to exclusively control a function of an electrosurgical instrument connected to the electrosurgical generator;

a handpiece for holding the electrosurgical instrument, wherein the handpiece is one of the plurality of control devices connected, in use, to the electrosurgical generator.

2. An electrosurgical system according to claim 1, wherein the electrosurgical system further comprises a footswitch, the footswitch being connected, in use, to the electrosurgical generator.

3. An electrosurgical system according to claim 2, wherein the electrosurgical generator is operable, in the first mode to assign, via the user interface, an electrosurgery control function to the handpiece and a shaving control function to the footswitch such that the handpiece is configured to exclusively control the electrosurgery function of the electrosurgical instrument and the footswitch is configured to exclusively control the shaving function of the electrosurgical instrument.

4. An electrosurgical system according to claim 2, wherein the electrosurgical generator is operable in the first mode to assign, via the user interface, a shaving control function to the handpiece and an electrosurgery control function to the footswitch such that the handpiece is configured to exclusively control the shaving function of the electrosurgical instrument and the footswitch is configured to exclusively control the electrosurgery function of the electrosurgical instrument.

5. An electrosurgical system according to any of claims 2-4, wherein the footswitch is connected to the electrosurgical generator using a wired connection.

6. An electrosurgical system according to any of claims 2-4, wherein the footswitch is connected to the electrosurgical generator using a wireless connection.

7. An electrosurgical system according to any of claims 1-6 wherein the electrosurgical generator is further operable in the first mode to store a plurality of user presets having respective assignment configurations for assigning control functions to each of the plurality of control devices.

8. An electrosurgical system according to any preceding claim wherein the electrosurgical generator is operable in the first mode, to disable, via the user interface, at least one control function on one or more of the plurality of control devices.

9. An electrosurgical system according to any preceding claim wherein the handpiece has buttons for controlling an electrosurgery function and/or a shaving function of the electrosurgical instrument.

10. An electrosurgical system according to any preceding claim wherein the footpiece has pedals for controlling an electrosurgery function and/or a shaving function of the electrosurgical instrument.

11. An electrosurgical system according to any preceding claim wherein the electrosurgical generator is operable in a second mode, via the user interface, to:

select one control device of the plurality of control devices connected, in use, to the electrosurgical generator via the user interface; and

assign one or more control functions to the selected control device via the user interface.

12. An electrosurgical system according to any preceding claim wherein the electrosurgical generator is operable in a third mode to:

automatically select the most recent control device connected to the electrosurgical generator; and

assign control functions to the selected control device via the user interface.

13. An electrosurgical instrument for use in the electrosurgical system of any of claims 1-12, wherein the electrosurgical instrument is configured to perform at least one of an electrosurgery function and a shaving function.

14. A method of operating an electrosurgical system for controlling an electrosurgical instrument, the method comprising:

selecting, via a user interface on a electrosurgical generator, a first mode of operation for the electrosurgical generator;

assigning, via the user interface on the electrosurgical generator, respective control functions to each of a plurality of control devices connected to the electrosurgical generator such that each control device is configured to exclusively control a function of an electrosurgical instrument connected to the electrosurgical generator via a handpiece.

Application No:	GB2006417.6	**Examiner:**	Robert Crowshaw
Claims searched:	1-12 & 14	**Date of search:**	27 October 2020

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-11 & 14	US 2020/078111 A1 (OBERKIRCHER) See paragraphs 251, 265-268, 285-286, 329, 336-338, 360 & 364 and figures 22 & 36B.
A	-	GB 2582318 A (TULP) An example of an electrosurgical end effector with mechanical cutting and electrosurgical coagulation or ablation.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A61B

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC, Patent Fulltext

International Classification:

Subclass	Subgroup	Valid From
A61B	0018/12	01/01/2006