(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 126 098 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
29.01.2025 Bulletin 2025/05

(21) Application number: **15772767.8**

(22) Date of filing: **30.03.2015**

(51) International Patent Classification (IPC):
B25F 5/00 *(2006.01)* ***G07C 3/08*** *(2006.01)*
G07C 9/38 *(2020.01)*

(52) Cooperative Patent Classification (CPC):
G07C 3/08; B25F 5/00; G07C 9/38

(86) International application number:
PCT/US2015/023243

(87) International publication number:
WO 2015/153398 (08.10.2015 Gazette 2015/40)

(54) ELECTRONIC TOOL LOCK

SCHLOSS FÜR ELEKTRONISCHES WERKZEUG

VERROUILLAGE D'OUTIL ÉLECTRONIQUE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **02.04.2014 US 201461973932 P**

(43) Date of publication of application:
08.02.2017 Bulletin 2017/06

(73) Proprietor: **Ridge Tool Company**
Elyria, OH 44035 (US)

(72) Inventors:
- **KREUZER, Rudolf**
  Elyria, Ohio 44035 (US)
- **KRONDORFER, Harald**
  Elyria, Ohio 44035 (US)
- **POND, Frederick D.**
  Elyria, Ohio 44035 (US)

(74) Representative: **Mader, Joachim**
Bardehle Pagenberg Partnerschaft mbB
Patentanwälte, Rechtsanwälte
Prinzregentenplatz 7
81675 München (DE)

(56) References cited:
EP-A1- 1 273 723
EP-A2- 2 680 093
WO-A1-2006/003455
WO-A1-2011/077001
WO-A1-2013/063507
AU-A1- 2012 258 380
GB-A- 2 418 252
US-A1- 2009 015 372
US-A1- 2009 138 116
US-A1- 2009 251 330
US-A1- 2013 109 375

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 3 126 098 B1

Description

CROSS REFERENCES TO RELATED APPLICATION

[0001] This application claims priority upon US provisional application serial No. 61/973,932 filed April 2, 2014 and US nonprovisional application serial No. 14/665,088 filed March 23, 2015.

FIELD

[0002] The present invention relates to a method for governing use of a tool according to the preamble of any of claims 1, 5, 9 or 10 as well as to a system for governing use of a tool according to the preamble of claim 12. Such methods and such a system are known from WO 2013/063507 A1.

BACKGROUND

[0003] Remote activation systems are known in the art and have been used in electronic devices such as digital cameras, laptop computers, and other electronic instruments. Although satisfactory in many respects, these systems often require lengthy or intricate set-up or initialization procedures for the purchaser or owner of the device. In addition, depending upon the features of the remote activation system, such systems may also be expensive and significantly increase the cost of the device into which they are incorporated.

[0004] Remote activation and tracking systems have also been applied to tools for example in order to track location of a tool within a facility or to monitor use of the tool. Again, although such systems have been found to be useful in certain aspects, it can be difficult to incorporate tools into such a system and use the tools without undue interruption. In addition, such systems may also increase the cost of the tools.

[0005] Industrial or construction jobsites are not conducive for the use of remote activation and tracking systems for tools, particularly if the systems use sophisticated electronic circuitry and software. Such jobsites are typically field-based, and may be susceptible to power outages or lack of a reliable source of electrical power. Thus many remote activation systems which require continuous communication cannot be used. For example, US 7,298,240 is directed to a system for electronically and remotely enabling devices such as tools. Although satisfactory for certain environments, the system of the '240 patent requires the presence of a wireless signal provided by an electronic key. As previously noted, for many field-based j obsites, it is not practical and in many instances not possible to provide a wireless signal to be present at all times and/or at all locations of a jobsite.

[0006] In addition, such jobsites often experience adverse environmental conditions such as exposure to rain, snow, high and/or low temperatures, and dirt and mud. Furthermore, jobsites may experience electrical interruption or interference. Exposure to such conditions can interfere with wireless communication during use of tools at a jobsite.

[0007] Furthermore, users of tools at such j obsites in many instances are not the owners of such tools and so their use and handling of the tools may not be with the utmost care or in a manner so as to promote wireless communication with tools at a jobsite. Additionally, tool users at such jobsites are typically not motivated to ensure incorporation of tools into an electronic remote activation or tracking system. And so in many instances, users may bypass the electronic system and thereby use the tools in an unauthorized manner.

[0008] Electronic theft protection systems for tools are known such as provided by Hilti Inc. The Hilti TPS system consists of a company card, activation key, and an electronic module inside the tool. A unique theft protection code is set initially in each tool using the company card. Authorized users unlock the tool by holding the activation key to the tool to unlock the tool. If the tool is stolen, it will lock after 20 minutes and can not be restarted without the activation key. Although satisfactory in certain aspects, implementation and use of the system at a jobsite and/or with multiple tools becomes cumbersome because separate cards are required for each tool. Furthermore, if the activation key is lost or stolen, the tool is unusable. Reference document EP 2 680 093 A2 relates to a system for enhancing power tools and particularly a system for wirelessly enhancing power tools. Reference document US 2009/138116 A1 relates to complex systems, and more particularly to collaborative assembly and maintenance of complex systems using a power tool. Reference document WO 2013/063507 A1 relates to systems and methods for tracking power tools and related devices.

[0009] In view of these and other concerns, a need remains for provisions and related methods whereby tools can be remotely enabled and which do not require the presence of a wireless signal, with minimal or no involvement from the tool user, and which provisions are inexpensive and relatively easy to implement and maintain.

SUMMARY

[0010] The difficulties and drawbacks associated with previously known systems are addressed in the present tools, systems, and methods according to the present subject matter. According to the present invention the above noted problems are solved by methods for governing use of a tool according to claims 1, 5, 9 and 10, and a system for governing use of a tool according to claim 12. Preferred embodiments of the present invention are defined in the dependent claims.

[0011] As will be realized, the subject matter described herein is capable of other and different embodiments and its several details are capable of modifications in various respects. Accordingly, the drawings and description are

to be regarded as illustrative and not restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Figure 1 is a schematic illustration of a system for governing and/or monitoring tool use in accordance with the present subject matter.

Figure 2 is a schematic illustration of components incorporated in a tool in accordance with the present subject matter.

Figure 3 is a schematic diagram illustrating a method of registering a tool with a system and continued use of the tool in accordance with the present subject matter.

Figures 4-6 are schematic diagrams illustrating methods of governing tool use in accordance with embodiments of the present subject matter.

Figure 7 is a schematic diagram illustrating another method of governing use of a tool in accordance with an embodiment of the present subject matter.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0013] The present subject matter provides systems and methods which govern use of one or more tools by utilizing an activation or actuation signal or transmission which enables subsequent tool operation. After receipt of the initial signal by the tool, the tool does not require any further communication, and particularly does not require the presence of a continuous signal for subsequent operation.

[0014] The systems of the present subject matter generally comprise (i) a registration and control component, typically provided by one or more computer servers or information processing units for issuing activation signal(s), (ii) one or more mobile electronic devices for communicating with one or more tools of interest and relaying activation signal(s) to the tools, and (iii) at least one tool including electronic data storage provisions, communication provisions, and electronic locking provisions, all of which are described in greater detail herein.

[0015] Generally, the tool(s) are initially provided with their electronic locking provisions deactivated. Thus, the tools can be used in a conventional fashion. If the tools are registered with the system, a tool owner or party with supervisory status is prompted to select an operating mode for the tool. One operating mode enables the tool to be used without supervision or control from the system. This mode is referred to herein as a "free mode" or "indefinite duration mode". If that mode is selected for the tool, the electronic locking provisions remain deactivated. Another operating mode referred to herein as a "supervised mode," enables the tool to be used for (i) a preset period of time (or until a specified time or date), or (ii) for a preset number of activation cycles, or (iii) until the first occurrence of either (i) or (ii). In the supervised mode, the tool owner or supervisor specifies one or both of (i) a maximum amount of cumulative time during which the tool is operational, and (ii) a maximum cumulative number of activation cycles during which the tool is operational. The tool owner or supervisor can also specify a time and date at which activation expires. The selections are stored in the data storage provisions of the tool. In certain embodiments, the system transmits an activation signal which is relayed to the tool by the mobile device thereby activating the electronic locking provisions and enabling tool operation. After receipt of the activation signal by the tool subsequent communication with the tool (and the system) is not required until the enabling parameter expires. Thus, the tool can be used at remote locations in which wireless signals are not present. In particular embodiments, operation of the tool is enabled upon resetting of a timer and/or a counter.

[0016] If the selected parameter is time of tool operation, during all instances of tool operation, the operation time is cumulatively measured. This measured cumulative operation time is continuously compared to the maximum amount of cumulative time previously specified and stored in the tool. Once the measured cumulative time of tool operation is greater than the specified maximum amount of cumulative time, the electronic locking provisions are caused to disable tool operation. Disabling tool operation does not require communication between the tool and the system or mobile device.

[0017] If the selected parameter is number of activation cycles of the tool, all instances of tool activation are cumulatively measured. The measured cumulative number of activation cycles is continuously compared to the maximum cumulative number of activation cycles previously specified and stored in the tool. Once the measured cumulative number of activation cycles is greater than the specified maximum number of activation cycles, the electronic locking provisions are caused to disable tool operation.

[0018] If the limiting parameter is a set time/date, the internal real time clock compares actual time with the set expiration date. If expiration is reached, the tool is disabled.

[0019] It will be understood that the present subject matter includes the use of a variety of parameters to limit and/or govern tool use. That is, the present subject matter includes the use of different parameters and/or additional parameters than the time of tool operation, number of activation cycles of the tool, and/or a set time/date.

[0020] The tool(s) of the present subject matter do not require continuous and direct communication with the registration and control component. Instead and as previously described, in certain embodiments the registration and control component issues a one-time activation signal to the mobile device, which relays that signal to the tool of interest. And in certain versions, the tools are enabled by resetting timers and/or counters in the tool and thus no activation signals to the tools are required.

Registration and Control Component

[0021] The registration and control component receives information and data, retains information and data, administers access and use permissions, and governs user access to, and use of, tools registered with the system. The registration and control component in many embodiments of the present subject matter is provided by one or more computer servers or units which may be remotely located. As described herein, typically the one or more registration and control component(s) is accessed via the internet and can include cloud-based storage, processing, and/or communication.

[0022] The registration and control component includes a database and/or data storage provisions in which user information is retained. Nonlimiting examples of such information include user name; registrant name if different than the user name; company or organization name; contact information of user, registrant, and/or company; date of initial registration of user and/or tool(s) and optionally dates of subsequent registrations or logins; password(s) and other confidential information relating to the user, registrant, and/or company; designation or status of the user, registrant, and/or company, e.g, industrial, contractor, builder, or home user; location of registered user and/or tool; preset or predesignated tool parameters; actual use-based tool parameters; warnings or indicators associated with registered tools and/or users; status of warnings or indicators; and a wide array of other information and data such as the IP address used to register the tool or to enable the tool.

[0023] The registration and control component may include communication provisions so that the component can exchange, transmit, and/or receive information or data from the one or more mobile electronic devices. In many embodiments of the present subject matter, the registration and control component includes internet communication provisions.

[0024] In many versions of the present subject matter, the systems and particularly the registration and control component use cloud-based storage and/or cloud-based processing and thus can be accessed and implemented in a distributed fashion using remotely located servers or other computers. Typically such servers, computers or other devices are accessed via the internet.

[0025] Cloud-based storage and/or processing refers to online storage and/or processing by which data is virtually stored and/or processed across one or multiple servers, which are typically hosted by service providers. The term "cloud-based computing" refers to one or more of cloud-based data storage, cloud-based data processing, and/or cloud-based data communication. The service providers may include data center operators, which virtualize resources based on customer requirements. The storage services may be accessed via web service application programming interfaces (API) or via web-based user interfaces (UI). Cloud-based computing is described in the prior art such as for example in WO 2013/141868; US 2012/0060165; WO 2013/119247; and US 2011/0153868.

Mobile Electronic Device(s)

[0026] The present subject matter system also comprises one or more mobile electronic devices. The mobile devices can be in a variety of forms such as smartphones, tablet computers, or laptop computers for example. More particularly, the mobile device includes a computing device that may be a small-form factor portable (or mobile) electronic device such as a mobile phone or smartphone, or, alternatively, a personal data assistant (PDA), a personal media player device, an application specific device such as a tablet or slate computing device, or a hybrid device that may include any of the above functions. Nonlimiting examples of smartphones include devices running on ANDROID or IPHONE, e.g., iOS, platforms. Nonlimiting examples of tablet computing devices include IPAD available from Apple Corporation. Nonlimiting examples of a personal media player device is an IPOD or more particularly an IPOD TOUCH available from Apple. The mobile device may also be in the form of a personal computer including both laptop computer and non-laptop, e.g., desktop, computer configurations.

[0027] The mobile devices include electronic data storage provisions, control provisions, communication provisions, and user interface provisions. The data storage provisions of the mobile devices enable information relating to tool use, user information, and data and/or permissions from the registration and control component to be stored and/or accessed at the mobile device. The data storage provisions can be in the form of known data storage formats such as flash memory components. The data storage provisions may also include or be in the form of memory cards, disk or drive components, data cartridges or components such as ROM or RAM memory, and peripheral data storage components.

[0028] The control provisions of the mobile devices typically include electronic circuitry and generally in the form of one or more processors. In many embodiments, the mobile devices control data and/or information exchange or transmission with one or more tools registered with the system. As previously described, the mobile devices relay activation signal(s) issued from the registration and control component to the tool(s).

[0029] The mobile devices also include communication provisions between the mobile device and one or more tools; and between the mobile device and the registration and control component. Communication between the mobile device and the tool(s) can be established or provided using one or more communication formats such as radio frequency (RF), infrared (IR), and/or BLUETOOTH as known in the art. In particular embodiments, communication is by a wireless local area network (WLAN), i.e., Wi-Fi. The present subject matter also includes the use of other types of communication such as near-field communications (NFC). A nonlimiting

list of other potentially suitable wireless protocols for communication between the mobile device and tool(s) of interest include ZIGBEE, GLOWPAN, Wireless HART, ISA 100, WiMi, SimpliciTI, KNX, EnOcean, Dash7, WISA, ANT, ANT+, WiMax, ONE-NET, Z-Wave, Insteon, and RuBee. In certain embodiments, communication between the mobile device and tool(s) can also be established by cables or other hardwired connections.

[0030] Mobile devices may be communicatively coupled to cloud-based service and data centers and/or a third party entity via, e.g., at least a wireless local area network technology (WLAN), i.e., Wi-Fi. However, embodiments of local access to cloud-based storage are not limited to wireless communications, and therefore hardwired communications may also apply to the embodiments described herein.

[0031] The mobile devices also include communication provisions between the mobile device and the registration and control component. Typically, such communications are via the internet, and utilize a cloud-based infrastructure. However, the present subject matter also includes the use of other communications between the mobile devices and the registration and control component.

[0032] The mobile devices also include one or more user interface provisions. In a particular embodiment of the present subject matter, the mobile device is in the form of a smartphone or portable electronic computer for example an IPAD. The mobile device may also include a keyboard which can be virtual or provided as a physical input device incorporated in the mobile device or separate therefrom but connectable thereto. Other input components can be used such as mouses, track balls, and joysticks for example. The mobile device typically also includes a display or other information output so that information can be displayed for viewing by a user. Again, the display is typically incorporated within the mobile device, but the present subject matter includes the use of separate but connectable displays.

[0033] As previously noted, the mobile devices also include electronic data storage provisions and control provisions. In many embodiments of the present subject matter, the mobile device is configured to run or execute an algorithm or "app" as known in the art which facilitates communication with the registration and control component and/or the tool. Apps, their transfer or download, and running and maintenance thereof are described in the prior art such as for example in US 8,549,656; US 2013/0122861; WO 2013/163249; and WO 2012/155937. The algorithm or app may also facilitate administration of permissions from the registration and control component, transmission of data or information between the registration and control component and the mobile device, and/or the mobile device and the tool(s) of interest. The algorithm or app may additionally facilitate user access, use of one or more tools of interest, and/or provide indications and/or warnings to a user concerning the tools and/or the system.

[0034] Figure 1 schematically illustrates an embodiment of a system 10 in accordance with the present subject matter. The system 10 comprises one or more tools 20, one or more mobile devices 30, and a registration and control component 40. In many embodiments of the present subject matter, the system 10 also comprises a cloud-based infrastructure 50 for providing communication between the registration and control component 40 and the one or more mobile devices 30.

[0035] The system 10 comprises one or more communication links between the tool(s) 20 and the mobile device(s) 30 collectively shown in Figure 1 as link(s) A. More particularly, other nonlimiting examples of tools include a drill 22 which can communicate with the mobile device 30 via link(s) A', a table saw 24 which can communicate with the mobile device 30 via link(s) A", and a miter saw 26 which can communicate with the mobile device 30 via link(s) A‴. Additional nonlimiting examples of tools include measurement devices such as thermal cameras or inspection devices such as drain inspection cameras. The system 10 also comprises one or more communication links between the mobile device(s) 30 and the cloud-based infrastructure 50 collectively shown in Figure 1 as link(s) B. The system can also comprise additional mobile device(s) collectively depicted as 30' which can communicate with the cloud 50 via link(s) B'. The system 10 also comprises one or more communication links between the registration and control component 40 and the cloud-based infrastructure 50 collectively shown in Figure 1 as link(s) C. It is contemplated that communication link(s) could also be provided directly between the registration and control component 40 and the mobile device(s) 30. In addition, the system 10 can comprise one or more personal computers (PCs) or laptop computers 60 which can communicate via link(s) D with the registration and control component 40. And, the system 10 can also comprise one or more personal computers (PCs) or laptop computers 65 which can communicate with the cloud 50 via link(s) E. The present subject matter also includes variations of these systems. For example, computers 60 and/or 65 can also be configured to communicate with the tool(s). Thus the computers 60, 65 serve a role of the mobile device 30.

[0036] In certain embodiments, the mobile device can be configured as a "trusted" device. In this aspect, the mobile device can receive, store, and/or issue one or more actuation code(s) that can be used repeatedly. In this aspect, it is also contemplated that repeated issuance of an actuation code may not require communication between the trusted mobile device and the registration and control component.

Tool(s)

[0037] The present subject matter system also comprises one or more tools having electronic data storage provisions, electronic control circuitry, and communication provisions. As previously noted, the tools may be in

the form of various devices such as cameras, or measurement or inspection devices. In many embodiments, the tools also comprise electronic lock or locking provisions. Typically, the tools are electrically powered or at least include electrical controls. In many embodiments, the tools are hand-held tools however the present subject matter includes other tools or tool systems such as stationary or non-mobile tool systems such as floor standing equipment or transportable or bench top tools. One or multiple tools can be utilized with the registration and control component and the mobile devices. Nonlimiting examples of tools include press tools, crimping tools, inspection or remote viewing systems, locating equipment, rotary powered tools including drills, grinders, impact tools, powered wrenches, expansion tools, shaping or forming tools, table saws, circular saws, miter saws, and the like. A wide array of tools are encompassed by the present subject matter.

[0038] The electronic data storage provisions are typically incorporated in the tool and can be in the form of known data storage formats such as flash memory components. The data storage provisions may also include or be in the form of memory cards, disk or drive components, data cartridges or components such as ROM or RAM memory, and peripheral data storage components. The electronic control circuitry includes one or more electronic processors configured to implement and execute the systems and methods described herein. The communication provisions are typically selected in view of the communication provisions of the mobile device(s). A wide array of communication formats can be used for the tool including but not limited to radio frequency, infrared, BLUETOOTH, Wi-Fi, near-field communications, and cable-based communications. The previously noted communication protocols can be used for tool communication.

[0039] Figure 2 is a schematic illustration of components incorporated in a tool 20 of the present subject matter. The tool 20 generally comprises a power source 110 which typically includes one or more batteries and/or a source of external electrical power, memory and data storage provisions 120, one or more electronic controllers 130, communication receiving provisions 140, and communication transmitting provisions 150. The electronic controllers 130 typically include microprocessor based circuits that can be configured to perform a wide array of tool operation and control functions. The electronic controllers 130 also include locks and/or the measurement circuits. For versions of the tool that include provisions for the tool to become disabled upon expiration of one or more particular time periods and/or upon reaching a particular time/date, any of which can potentially be prescribed by a user, the tool includes a real time clock and/or a timer. The measurement circuits can also include one or more "counters" that can be configured to count various aspects of tool operation such as a number of tool actuations. The tool 20 may also comprise electronic lock provisions 160 as described in greater detail herein. And, the tool 20 may also comprise one or more sensors collectively shown as 170 to sense one or more parameters, typically in real-time relating to tool use, operating conditions, and/or ambient conditions. Nonlimiting examples of such sensors include temperature sensors, pressure sensors, force sensors, electrical current sensors, electrical voltage sensors, accelerometers, counters, and time sensors to measure time periods of use or particular conditions of use. Many currently available tools and tool systems include electronic controls for operating the tool. Thus, one or more of components 110, 120, and 130 may in certain applications be readily configured in the tool(s) of interest. The communication provisions 140, 150 as previously described correspond to the communication format of the mobile device(s).

[0040] The electric or electronic lock provisions incorporated in tools of the present subject matter can take a variety of different forms and configurations. The lock provisions can be configured to enable tool use upon receiving an activation signal. The activation signal can be issued from the registration and control component and/or the mobile device, or be based upon signals from both. Typically, the activation signal is issued from the registration and control component and relayed by the mobile device to the tool.

[0041] The electronic lock provisions can be in the form of algorithm instructions executed entirely or at least partially by electronic circuitry in the tool. If such virtual electronic lock provisions are executed partially by the tool, the other algorithm instructions can be executed at the mobile device and particularly using the noted app. Alternatively or in addition, it is also contemplated that algorithm instructions can also be executed at the registration and control component.

[0042] The electronic lock provisions can also include one or more physical components such as a switch that connects or disconnects actuation circuit(s) and/or power supplies of the tool(s). In certain embodiments, the electronic lock provisions utilize one or more field effect transistors (FET) to provide switching or activation of the tool of interest. These circuits when used for enabling tool operation as described herein are referred to as FET-based electronic lock provisions. The present subject matter electronic lock provisions can be provided in a wide array of formats and configurations.

Methods

[0043] The present subject matter also provides various methods and techniques for governing and monitoring use of tool(s) registered in the system. Generally, many of the methods involve initially registering or updating a previously registered tool with the system and particularly with one or both of the registration and control component and/or the mobile device(s).

[0044] Figure 3 schematically depicts a method 200 in accordance with the present subject matter in which a tool is registered with a system such as registering the

tool 20 with the system 10 in Figure 1. The method 200 shown in Figure 3 comprises one or more operations in which a user registers himself or herself with a system. These operations are collectively denoted as 210 in Figure 3. The user registration operations may include the user providing identifying information, contact information, and information pertaining to the tool(s) of interest. The user registration operations may also include assigning a unique password and/or identification to the user.

[0045] The method 200 also comprises one or more operations collectively denoted as 220 in which the user utilizing one or more mobile devices, establishes identification between a mobile device such as a smartphone for example and the registration and control component. The operations 220 may also include obtaining or otherwise downloading an algorithm or app to the mobile device, to facilitate user control and operation of the tool(s) of interest and/or to facilitate communication and/or data exchange between one or both of (i) the tool and the mobile device, and (ii) the registration and control component. In many embodiments of the present subject matter, operations 220 are performed by a user establishing communication between the mobile device and the registration and control component, downloading an algorithm or app to the mobile device, and then using the algorithm or app and the mobile device, and entering a unique user password to log into the user's registration data or account maintained at the registration and control component.

[0046] Once logged into their account, a user may select one or more tool parameters and/or other items associated with the tool, user, and the like. These operations are collectively depicted in Figure 3 as 230. For example, after logging into their account, a user can select how long a tool of interest shall remain operational. For example, a user may select an activation time period of 24 hours, 1 week, 2 weeks, 1 month, 3 months, 6 months, or other time period. It will be understood that the present subject matter includes selection of activation time periods less than these, greater than these, and/or different than these time periods. In certain embodiments, the system and/or tool is configured such that if an activation time period of 1 month is selected, the tool of interest will remain operational at any time up to 1 month. After expiration of the 1 month activation time period, the tool is disabled and cannot be used until corrective action is taken. An example of such corrective action is a user logging into the system and re-activating the tool to cause the system to issue an activation code or electronic signal to the tool. In addition in certain embodiments, a user can select how many cycles or intervals of operation are permitted for a tool. For example, a user may select a number of cycles or intervals of operation as 10 cycles, 100 cycles, 500 cycles, 1,000 cycles, 10,000 cycles, or any other number of cycles. In addition in certain embodiments, a user can select permitted operating ranges of tool(s). Alternatively, or in addition, a user can select certain parameters of the tool or use of the tool, which if sensed or experienced result in the tool being rendered inoperable. For example, if a certain number of cycles of tool use are exceeded, the tool is disabled. These and other user selectable parameters can be set during operation 230. These parameters can be entered and stored into the system at the registration and control component, the mobile device, or both. Regardless, the parameters are stored in the tool.

[0047] In certain embodiments, the method 200 also comprises one or more operations collectively denoted as 240 in Figure 3, of transmitting an activation signal to the mobile device. The operation(s) 240 can also include establishing a communication link between the mobile device and the registration and control component. This link is schematically shown in Figure 1 as links B, C. And, in certain embodiments, the method 200 additionally comprises one or more operations collectively shown as 250 in Figure 3, of relaying the activation signal to the tool. The operation(s) 250 can also include establishing a communication link between the mobile device and the tool, which is schematically shown in Figure 1 as link A. The method 200 can also include one or more operations 260 in which the mobile device transmits data to the system.

[0048] In many embodiments, during or after establishing communication link(s) between the mobile device and the tool of interest, an activation code or permission is transmitted or otherwise provided to the tool. Typically, the activation signal is issued from the system and relayed by the mobile device to the tool. Receipt of the activation code by the tool typically enables operation of the tool. The activation code or permission can be issued by the registration and control component and then relayed from the mobile device to the tool. Alternatively and as described in greater detail herein, in certain embodiments the system and tool(s) are configured such that the tool is initially enabled or permitted to operate and thus does not require an initial activation signal from the registration and control component and/or the mobile device. For example, a tool having electronic locking provisions can initially be provided by a manufacturer or supplier with such provisions in a deactivated state thereby allowing tool operation.

[0049] Figures 4-6 schematically illustrate methods of governing tool use in accordance with the present subject matter. In a method 300, a tool is initially provided with its electronic locking provisions deactivated. In this state, the tool can be operated in a conventional manner. This is shown in Figure 4 as 302.

[0050] In operation 304, the tool user, owner, or other party selects whether to register the tool with the system. If the party decides to not register the tool, denoted at 306, then the electronic locking provisions remain deactivated as shown at 308.

[0051] If the party decides to register the tool with the system, denoted at 310, the party is then prompted at 312 to select an operating mode for the tool. If a "free" or

"indefinite duration" mode (also referred to as an "infinite" or "infinite duration" mode) is selected, shown as 314, then the electronic locking provisions remain deactivated as depicted at 316.

[0052] If the party decides to register the tool and selects a "supervised" mode shown as 318, the party is then prompted to select one or more parameter(s) to govern tool operation. The parameters may include a maximum cumulative time Tm, a maximum cumulative number of activation cycles Nm, or both of these parameters. This is denoted in Figure 5 as 320. It will be appreciated that the present subject matter is not limited to the use of these parameters and includes the use of one or more other parameters.

[0053] If the owner or supervisor selects maximum cumulative time Tm for governing tool operation, a timer is reset and the electronic locking provisions enable tool operation.

[0054] During tool operation, the tool measures a cumulative time of tool operation To, which is shown in Figure 5 as 330. The measured cumulative time of tool operation To is compared to the maximum cumulative time of tool operation previously specified at 320. This comparison is depicted in Figure 5 as 335. If To is greater than Tm, any further operation of the tool is prevented. The tool is disabled, as shown at 340. If however, To is less than Tm, the tool is allowed to operate as shown at 345. During further tool operation, the cumulative time of tool operation is measured, hence the method is repeated from operation 330, to comparison 335, to one of the results 340 or 345. If result 345 occurs, the method is again repeated from 330 as previously described.

[0055] If the owner or supervisor selects a maximum cumulative number of activation cycles Nm for governing tool operation, a counter is reset and the electronic locking provisions enable tool operation.

[0056] During tool operation, the tool measures a cumulative number of activation cycles No, which is shown in Figure 5 as 355. The measured cumulative number of activation cycles No is compared to the maximum cumulative number of activation cycles Nm previously specified at 320. This comparison is shown in Figure 5 as 360. If No is greater than Nm, then any further operation of the tool is prevented. The tool is disabled, as shown at 365. If however, No is less than Nm, the tool is allowed to operate as shown at 370. During further tool operation, the cumulative number of tool activation cycles is measured, hence the method is repeated from operation 355, to comparison 360, to one of the results 365, 370. If result 370 occurs, the method is again repeated from 355 as previously described.

[0057] If the owner or supervisor selects to disable the tool upon a first occurrence of either the maximum cumulative time Tm and the maximum cumulative number of activation cycles Nm, the previously noted timer and counter are reset. The tool is enabled for operation.

[0058] During tool operation, the tool measures both a cumulative time of tool operation To and a cumulative number of activation cycles No as shown at 380. The method compares the measured signals to the corresponding maximum cumulative time of tool operation Tm and the maximum cumulative number of activation cycles Nm previously specified. This comparison is shown in Figure 6 as 385. If either (i) To is greater than Tm or (ii) No is greater than Nm, then any further operation of the tool is prevented. The tool is disabled, as shown at 395. If however, both (i) To is less than Tm and (ii) No is less than Nm, the tool is allowed to operate as shown at 390. During further tool operation, the cumulative time of tool operation and the cumulative number of tool activation cycles are measured, hence the method is repeated from operation 380, to comparison 385, to one of the results 390, 395. If result 390 occurs, the method is again repeated from 380 as previously described.

[0059] Thus, in particular versions of the present subject matter, methods are provided for governing use of one or more tools by selecting one or more parameters and designating maximum values or limits for the selected parameters, monitoring one or more selected parameters, and comparing current values to the designated maximum values. As previously described, non-limiting examples of such parameters include an activation time period for the tool and a number of activation cycles. Figure 7 schematically illustrates such a method 400. Generally, a method for controlling use of a tool comprises providing a system including (i) a registration and control component, (ii) at least one mobile electronic device, and (iii) at least one tool including electronic locking provisions. The mobile device is in communication with the registration and control component, and the electronic locking provisions are configured to enable operation of the tool. In certain embodiments, enabling the tool may require receipt of an activation signal. In other embodiments, the tools do not require an activation signal for operation. The method also comprises selecting at least one parameter which for example may be selected from the group consisting of (i) an activation time period, and (ii) a number of activation cycles. This is depicted in Figure 7 as 410. The method also comprises establishing a maximum value for the selected parameter(s). This is shown as 420 in Figure 7. For example, if the selected parameter is a tool activation time period, the maximum value for that parameter may be selected to be 1 month. Another example may be if the selected parameter is a number of tool activations, i.e., discrete uses of the tool, the maximum value for that parameter may be selected to be 500 activations. The method also comprises storing the maximum value for the selected parameter(s) on the tool. This is shown as 430 in Figure 7. The method also comprises comparing a current value of the selected parameter with the maximum value for the selected parameter. This is shown as 440 in Figure 7. If the current value of the selected parameter is greater than the maximum value for the selected parameter, then further use of the tool is prevented, such as shown at 450. In particular versions of the method 400, the selected

parameter is an activation time period in the form of an expiration date and the tool further includes data storage provisions. The method further comprises storing the expiration date in the data storage provisions in the tool. In this embodiment, the tool includes a real time clock. The comparing is performed by comparing the expiration date stored in the data storage provisions with a real time date provided by the system, and if the real time date is after the expiration date, the electronic locking provisions of the tool are actuated to thereby disable operation of the tool. It will be understood that the present subject matter includes the use of a wide array of parameters for governing tool use. Thus, the present subject matter is not limited to the particular examples of an activation time period and/or a number of activation cycles.

[0060] In still additional embodiments, the tool can be configured to monitor time of use. This aspect is beneficial in a number of applications. For example, monitoring total time of use when using certain cutter inserts with the tool is beneficial. After exceeding a particular total time of use, the cutter inserts may need to be changed. After a certain amount of time, an LED or other indicator is actuated to indicate the required change of the cutter inserts. After the inserts have been changed, the user connects with a mobile device to reset the LED and a counter or timer. During this connection, data between the device (and subsequently the device and the server) is exchanged.

[0061] In certain embodiments, the present subject matter systems and methods provide an array of additional features and functions as follows.

Preventing Tool Use

[0062] In many embodiments of the present subject matter, the systems prevent use of one or more tools based upon particular criteria and/or conditions.

[0063] Typically, the tool includes electronic locking provisions configured to disable tool use without a requirement of a deactivation signal being transmitted to the tool. After disabling of a tool such as by previously configuring the tool, the system can be configured such that the tool remains inoperable until the user activates the tool by logging into the system and accessing his or her account with the registration and control component. Upon logging into their account and permitting use, a permission signal is transmitted to the tool such as from the mobile device to the tool by BLUETOOTH.

[0064] In particular embodiments, such as when logging into the system from a mobile device, the user can declare the device as his own and a permanent code can be issued to, and stored onto the device (or other trusted device). Now the device can be used any time to activate the tool without logging into the system. And thus, the permanent code serves as a "permanent key" for the tool. Alternatively, a "one-time code" can be issued that allows the user to use the device only once for tool activation. Before using the device a second time, the user must establish a new connection to the system and obtain a new code.

[0065] In many embodiments of the present subject matter, a tool adapted for use with the system is initially provided or sold with the electronic lock disabled or inactive. Thus, any user who does not wish to use the electronic lock or register the tool with the system, can use the tool in a conventional fashion and without any further action.

Monitoring Tool Use

[0066] In certain embodiments of the present subject matter, various aspects of tool use can be monitored. For example, the system can be configured to collect and store data relating to tool use and transmit such data to a mobile device for subsequent uploading or transfer to the registration and control component. In certain versions, the system collects information relating to the time and duration of tool use. This enables a party such as a business owner or jobsite supervisor to monitor whether any unauthorized use such as after hour use of the tool(s) has occurred.

[0067] The present subject matter systems can also be configured to monitor, store, and/or display status information relating to each tool of interest.

Providing Information to User

[0068] The present systems can also provide a wide array of information and data to a user concerning tool(s) of interest and their use. The systems can be configured to send automated emails or other communications such as text messages to designated users or other parties such as tool service reminders, notification of tool deactivation, or the like.

[0069] Memory or data storage provisions incorporated in a tool or in a mobile device which have received tool data, can provide information to a user for display or further processing. For example, statistical processing of tool use data can be performed to provide information to users, other parties, and/or tool manufacturers.

Particular Features

[0070] As will be appreciated, the present subject matter systems and methods can be configured to provide a wide array of particular features.

[0071] In certain embodiments, a tool in accordance with the present subject matter and including electronic lock provisions is initially provided, sold, and/or provided to a user with the electronic lock provisions set to infinite use. This provides the user with an option of whether to utilize the electronic lock provisions. If the user decides to not use the provisions, such as if the user does not have access to a computer, the tool can be operated in a conventional fashion. More specifically, in many embodiments of the present subject matter, the electronic lock-

ing provisions are activatable and typically activatable by a user, operator, supervisor, or other party. Typically, after manufacture and assembly of a tool and upon purchase of the tool, the electronic locking provisions are set to allow infinite use, thereby allowing tool operation regardless of whether the tool is registered or used with the systems described herein.

[0072] In certain embodiments, the activation signals issued by the registration and control component and relayed by the mobile device(s) include one or more activation codes that may include instructions for the tools and components of the tools. For example, the activation codes may include instructions for the tool and/or its electronic locking provisions to enable operation of the tool upon receipt of the activation code. The activation codes can be created or generated by the registration and control component and selectively issued to the mobile devices. Embodiments are also contemplated in which a mobile device is configured to store multiple activation codes. In this manner, if a tool became disabled in the field such as due to exceeding a maximum cumulative time of tool operation, an operator could use the mobile device to issue another activation signal with an activation code to enable the tool to be used again. This re-activation of the tool using the mobile device would not require communication between the mobile device and the registration and control component. Alternatively, the user can designate a mobile device as a "trusted device" that can enable tool use without further connection with the server.

[0073] In certain embodiments, tools and/or the system can be configured such that any comparing of a current value of a selected parameter, e.g., an activation time period, a number of activation cycles, and/or a tool use parameter, with a maximum value selected for that parameter is performed prior to use of a tool. And in particular embodiments, the tools and/or system can be configured such that the comparing is only performed prior to use of the tool. This enables a user to finish a particular use or application of the tool.

[0074] In certain embodiments, tools can be configured to only operate within a predetermined time period and/or within predetermined operating parameters such as up to a designated number of operating cycles.

[0075] In certain embodiments, the systems can be configured to transmit, store, and/or display information concerning tool(s) and their use such as cycle counts, pressure data, warnings, and the like. Specifically, in particular embodiments of the present subject matter various data concerning tool use is collected and stored on the tool. Nonlimiting examples of such data include dates and times when the tool was used; if the tool is a press or crimp tool, data concerning crimp pressure, size of fittings pressed, and other associated measurements; temperatures during tool use; number of tool uses or actuations; and other information collected from sensors incorporated in the tool. The various data is stored in electronic data storage provisions onboard the tool. The data can be transferred or transmitted to one or more mobile device(s) in a subsequent communication between the tool and the mobile device. Once transferred to the mobile device, the data or a portion thereof can be transferred to the registration and control component or to other components of the system as desired.

[0076] In certain embodiments, the systems can be configured to transmit reminders relating to tool service and activation details which are derived or determined from tool use data.

[0077] In certain embodiments, reminder signals or other notifications may be issued by the system prior to expiration of any tool deactivation time periods or cycle counts. Thus, prior to disabling of the tool, a reminder signal is issued to warn of the tool nearing a state of being disabled. For example, if a tool is configured with a one week use period, a warning can be issued by the system prior to expiration of the one week time period, such as for example 24 hours prior to expiration. This allows a user to then reset or otherwise actuate the tool prior to expiration and resulting tool deactivation. For example, depending upon configuration of the system, a user can establish communication between his smartphone and the tool and renew the activation time period using an app running on the smartphone.

[0078] In certain embodiments, the tools can be provided with one or more illuminated indicators that emit light upon the locking provisions being in a state that prevents tool operation. For example, the illuminated indicator could be a light emitting diode (LED) which is activated to emit light upon the locking provisions disabling tool use. Referring to Figure 1, the tool 20 could include one or more illuminated indicators 20a and 20b that emit light such as red, yellow, or green light to indicate a locking state or other state of the tool.

[0079] The system can also be configured such that one or more tools can be activated or re-activated, using a primary or master activation or deactivation code.

[0080] The systems and/or electronic locking provisions allow tool use when a communication link is not established, such as if a data connection link between a tool and a mobile device cannot be established or is temporarily lost during tool use. Deferred updating of the tool use data and/or user information retained with the registration and control component can occur upon a subsequent data connection such as between the mobile device and the registration and control component, i.e., via the cloud.

[0081] In certain embodiments, the present subject matter also includes tools that include labels, tags, stickers, molded indicia, or other means to indicate that the tool includes electronic locking provisions. These are collectively referred to herein as "visual indicia." The visual indicia provide a clear visually perceptible warning that the tool includes anti-theft provisions, e.g., the electronic locking provisions and/or the additional aspects described herein. Referring to Figure 1, the tool 20 is depicted as including visual indicia 20c which may for

example be a label that is adhesively secured to the tool 20. The label 20c may convey that the tool includes electronic locking provisions and/or can be used with or registered with a system or database of the tool's manufacturer or supplier.

[0082] The present subject matter provides various advantages and benefits including the following. No permanent connection to a mobile device is required. Once activated, the tool can be used until one or more parameter(s) expire. No costly cell connection is required unlike other devices such as for example plug-in devices for cars. All communication is "relayed" via the mobile device, using data connection already associated with the mobile device and/or its use.

[0083] Many other benefits will no doubt become apparent from future application and development of this technology.

[0084] It will be understood that any one or more feature or component of one embodiment described herein can be combined with one or more other features or components of another embodiment. Thus, the present subject matter includes any and all combinations of components or features of the embodiments described herein.

[0085] As described hereinabove, the present subject matter solves many problems associated with previous strategies, systems and/or devices. However, it will be appreciated that various changes in the details, materials and arrangements of components, which have been herein described and illustrated in order to explain the nature of the present subject matter, may be made by those skilled in the art without departing from the scope of the claimed subject matter, as expressed in the appended claims.

Claims

1. A method for governing use of a tool (20), the method comprising:

   providing a system (10) including (i) a registration and control component (40), (ii) at least one mobile device (30), and (iii) at least one tool (20) including communication provisions and electronic locking provisions;
   registering the tool (20) with the registration and control component (40);
   selecting at least one parameter to govern tool operation;
   transmitting the parameter to the tool (20) to govern tool operation;
   whereby the tool (20) remains operational until disabled based upon the selected parameter and without receipt of a deactivation signal;
   characterised in that
   the parameter to govern tool operation is selected from the group consisting of (i) a maximum amount of cumulative time during which the tool is operational, (ii) a maximum cumulative number of actuation cycles during which the tool is operational, (iii) combinations of (i) and (ii), and (iv) an expiration date up to and during which the tool use is allowed.

2. The method of claim 1 further comprising:
   prior to disabling the tool (20) based upon the selected parameter, issuing a reminder signal to warn of the tool nearing disablement.

3. The method of any one of claims 1-2 further comprising:
   sending a message to a recipient in which the message includes information relating to tool operation.

4. The method of any one of claims 1-3 wherein the tool (20) further includes electronic data storage provisions (120) onboard the tool, and the method further comprising:

   collecting data regarding tool use and storing the data in the electronic data storage provisions (120),
   preferably further comprising:
   transmitting the stored data regarding tool use to the mobile device (30) every time a connection is established between the tool (20) and the mobile device (30).

5. A method for governing use of a tool (20), the method comprising:

   providing a system (10) including (i) a registration and control component (40); (ii) at least one mobile device (30), and (iii) at least one tool (20) including data storage provisions (120), communication provisions (140, 150), and electronic locking provisions (160);
   characterised in that the method further comprises the steps of:

   specifying a maximum amount of cumulative time during which the tool is operational;
   storing the specified maximum amount of cumulative time during which the tool is operational in the data storage provisions (120) of the tool;
   resetting a timer thereby causing the electronic locking provisions (160) to enable tool operation;
   during tool operation, measuring a cumulative time of tool operation;
   comparing the measured cumulative time of tool operation to the specified maximum amount of cumulative time during which the tool is allowed to be operational;

upon the measured cumulative time of tool operation being greater than the specified maximum amount of cumulative time during which the tool is allowed to be operational, causing the electronic locking provisions (160) to disable tool operation.

6. The method of claim 5 wherein the specified maximum amount of cumulative time during which the tool is operational is within a range of from 24 hours to 6 months.

7. The method of claim 5-6 wherein the at least one mobile device (30) is capable of communicating with the registration and control component (40), wherein preferably the communication between the mobile device (30) and the registration and control component (40) includes cloud-based infrastructure (50).

8. The method of any one of claims 5-7 further comprising:
after the electronic locking provisions (160) disable tool operation, transmitting a signal to reset the timer and choose a new parameter to the tool (20) thereby causing the electronic locking provisions (160) to enable tool operation, wherein preferably the transmitting of the signal to reset the timer and choose a new parameter is performed by at least one mobile device (30).

9. A method for governing use of a tool (20), the method comprising:

providing a system (10) including (i) a registration and control component (40), (ii) at least one mobile device (30), and (iii) at least one tool (20) including data storage provisions (120), communication provisions (140, 150), and electronic locking provisions (160);
characterised in that the method further comprises the steps of:

specifying a maximum cumulative number of actuation cycles during which the tool is operational;
storing the specified maximum cumulative number of actuation cycles during which the tool is operational in the data storage provisions (120) of the tool (20);
resetting a counter thereby causing the electronic locking provisions (160) to enable tool operation;
during tool operation, counting a cumulative number of actuation cycles;
comparing the counted cumulative number of actuation cycles with the specified maximum cumulative number of actuation cycles during which the tool is operational;
upon the counted cumulative number of actuation cycles being greater than the specified maximum cumulative number of actuation cycles during which the tool is allowed to be operational, causing the electronic locking provisions (160) to disable tool operation.

10. A method for governing use of a tool (20), the method comprising:

providing a system (10) including (i) a registration and control component (40), (ii) at least one mobile device (30), and (iii) at least one tool including communication provisions (40) and electronic locking provisions (160);
characterised in that the method further comprises the steps of:

specifying a maximum amount of cumulative time during which the tool is operational and a maximum cumulative number of actuation cycles during which the tool is operational;
storing the specified maximum amount of cumulative time during which the tool is operational and the maximum cumulative number of actuation cycles during which the tool is operational in data storage provisions (120) of the tool;
during tool operation, measuring a cumulative time of tool operation and counting a cumulative number of actuation cycles;
comparing the measured cumulative time of tool operation to the specified maximum amount of cumulative time during which the tool is allowed to be operational and comparing the cumulative number of actuation cycles with the specified maximum cumulative number of actuation cycles during which the tool is allowed to be operational;
upon a first occurrence of (a) the measured cumulative time of tool operation being greater than the specified maximum amount of cumulative time during which the tool is allowed to be operational and (b) the cumulative number of actuation cycles being greater than the specified maximum cumulative number of actuation cycles during which the tool is allowed to be operational, causing the electronic locking provisions (160) to disable tool operation.

11. The method of claim 10, wherein if during tool operation, the first occurrence of (a) and (b) occurs, the electronic locking provisions (160) disable tool operation after tool use is discontinued.

12. A system (10) for governing use of a tool (20), the system comprising:

a registration and control component (40) having data storage provisions and communication provisions;
at least one mobile electronic device (30) including data storage provisions, communication provisions, user interface provisions, and control provisions, the mobile device (30) capable of communication with the registration and control component and capable of transmitting an actuation signal that includes an actuation code;
a tool (20) having data storage provisions (120), communication provisions (130, 140), and actuatable electronic lock provisions (160), the tool (20) capable of communication with the mobile device (30) and receiving the actuation signal from the mobile device (30), the electronic lock provisions (160) upon actuation being configured to enable operation of the tool (20) upon receipt of the actuation code,
characterised in that
the system (10) is configured such that upon communication between the mobile device (30) and the registration and control component (40), the registration and control component (40) issues a one-time activation signal to the mobile device (30) thereby enabling communication between the mobile device (30) and the tool (20) to relay the activation signal to the tool (20).

13. The system (10) according to claim 12, wherein the activatable electronic locking provisions (160) of the tool (20) are initially provided in a deactivated state thereby allowing tool operation.

14. The system (10) according to claim 13, wherein the tool (20) further includes visual indicia (20c) indicating that the tool (20) includes electronic locking provisions (160), wherein preferably the visual indicia (20c) is in the form of a label affixed to the tool (20).

Patentansprüche

1. Verfahren zum Regeln der Verwendung eines Werkzeugs (20), das Verfahren umfassend:

Bereitstellen eines Systems (10), das (i) eine Registrierungs- und Steuerkomponente (40), (ii) mindestens eine mobile Vorrichtung (30) und (iii) mindestens ein Werkzeug (20), das Kommunikationsvorkehrungen und elektronische Verriegelungsvorkehrungen beinhaltet, beinhaltet;
Registrieren des Werkzeugs (20) mit der Registrierungs- und Steuerkomponente (40);
Auswählen mindestens eines Parameters, um den Werkzeugbetrieb zu regeln;
Übertragen des Parameters an das Werkzeug (20), um den Werkzeugbetrieb zu regeln;
wobei das Werkzeug (20) basierend auf dem ausgewählten Parameter und ohne Empfang eines Deaktivierungssignals betriebsfähig bleibt, bis es deaktiviert ist;
dadurch gekennzeichnet, dass der Parameter, um den Werkzeugbetrieb zu regeln, ausgewählt ist aus der Gruppe bestehend aus (i) einer maximalen Menge an kumulativer Zeit, während der das Werkzeug betriebsfähig ist, (ii) einer maximalen kumulativen Anzahl von Betätigungszyklen, während der das Werkzeug betriebsfähig ist, (iii) Kombinationen von (i) und (ii) und (iv) einem Ablaufdatum, bis zu und während dem die Werkzeugverwendung erlaubt ist.

2. Verfahren nach Anspruch 1, ferner umfassend:
vor dem Deaktivieren des Werkzeugs (20) basierend auf dem ausgewählten Parameter, Ausgeben eines Erinnerungssignals, um zu warnen, dass sich das Werkzeug der Deaktivierung nähert.

3. Verfahren nach einem der Ansprüche 1-2, ferner umfassend:
Senden einer Nachricht an einen Empfänger, wobei die Nachricht Information in Bezug auf den Werkzeugbetrieb beinhaltet.

4. Verfahren nach einem der Ansprüche 1-3, wobei das Werkzeug (20) ferner elektronische Datenspeichervorkehrungen (120) an Bord des Werkzeugs beinhaltet und das Verfahren ferner umfasst:

Sammeln von Daten in Bezug auf die Werkzeugverwendung und Speichern der Daten in den elektronischen Datenspeichervorkehrungen (120),
vorzugsweise ferner umfassend:
Übertragen der gespeicherten Daten in Bezug auf die Werkzeugverwendung an die mobile Vorrichtung (30) jedes Mal, wenn eine Verbindung zwischen dem Werkzeug (20) und der mobilen Vorrichtung (30) hergestellt wird.

5. Verfahren zum Regeln der Verwendung eines Werkzeugs (20), das Verfahren umfassend:

Bereitstellen eines Systems (10), das (i) eine Registrierungs- und Steuerkomponente (40), (ii) mindestens eine mobile Vorrichtung (30) und (iii) mindestens ein Werkzeug (20), das Datenspeichervorkehrungen (120), Kommunikationsvorkehrungen (140, 150) und elektronische Verriegelungsvorkehrungen (160) beinhaltet, bein-

haltet;
dadurch gekennzeichnet, dass das Verfahren ferner die folgenden Schritte umfasst:

Spezifizieren einer maximalen Menge an kumulativer Zeit, während der das Werkzeug betriebsfähig ist;
Speichern der spezifizierten maximalen Menge an kumulativer Zeit, während der das Werkzeug betriebsfähig ist, in den Datenspeichervorkehrungen (120) des Werkzeugs;
Zurücksetzen eines Zeitgebers, wodurch bewirkt wird, dass die elektronischen Verriegelungsvorkehrungen (160) den Werkzeugbetrieb ermöglichen;
Vergleichen der gemessenen kumulativen Zeit des Werkzeugbetriebs mit der spezifizierten maximalen Menge an kumulativer Zeit, während der das Werkzeug betriebsfähig sein darf;
wenn die gemessene kumulative Zeit des Werkzeugbetriebs größer als die spezifizierte maximale Menge an kumulativer Zeit ist, während der das Werkzeug betriebsfähig sein darf, Bewirken, dass die elektronischen Verriegelungsvorkehrungen (160) den Werkzeugbetrieb deaktivieren.

6. Verfahren nach Anspruch 5, wobei die spezifizierte maximale Menge an kumulativer Zeit, während der das Werkzeug betriebsfähig ist, innerhalb eines Bereichs von 24 Stunden bis 6 Monaten liegt.

7. Verfahren nach Anspruch 5-6, wobei die mindestens eine mobile Vorrichtung (30) in der Lage ist, mit der Registrierungs- und Steuerkomponente (40) zu kommunizieren, wobei vorzugsweise die Kommunikation zwischen der mobilen Vorrichtung (30) und der Registrierungs- und Steuerkomponente (40) eine cloudbasierte Infrastruktur (50) beinhaltet.

8. Verfahren nach einem der Ansprüche 5-7, ferner umfassend:
nachdem die elektronischen Verriegelungsvorkehrungen (160) den Werkzeugbetrieb deaktivieren, Übertragen eines Signals zum Zurücksetzen des Zeitgebers und Auswählen eines neuen Parameters an das Werkzeug (20), wodurch bewirkt wird, dass die elektronischen Verriegelungsvorkehrungen (160) den Werkzeugbetrieb ermöglichen, wobei vorzugsweise das Übertragen des Signals zum Zurücksetzen des Zeitgebers und Auswählen eines neuen Parameters durch mindestens eine mobile Vorrichtung (30) durchgeführt wird.

9. Verfahren zum Regeln der Verwendung eines Werkzeugs (20), das Verfahren umfassend:

Bereitstellen eines Systems (10), das (i) eine Registrierungs- und Steuerkomponente (40), (ii) mindestens eine mobile Vorrichtung (30) und (iii) mindestens ein Werkzeug (20), das Datenspeichervorkehrungen (120), Kommunikationsvorkehrungen (140, 150) und elektronische Verriegelungsvorkehrungen (160) beinhaltet, beinhaltet;
dadurch gekennzeichnet, dass das Verfahren ferner die folgenden Schritte umfasst:

Spezifizieren einer maximalen kumulativen Anzahl von Betätigungszyklen, während der das Werkzeug betriebsfähig ist;
Speichern der spezifizierten maximalen kumulativen Anzahl von Betätigungszyklen, während der das Werkzeug betriebsfähig ist, in den Datenspeichervorkehrungen (120) des Werkzeugs (20);
Zurücksetzen eines Zählers, wodurch bewirkt wird, dass die elektronischen Verriegelungsvorkehrungen (160) den Werkzeugbetrieb ermöglichen;
während des Werkzeugbetriebs Zählen einer kumulativen Anzahl von Betätigungszyklen;
Vergleichen der gezählten kumulativen Anzahl von Betätigungszyklen mit der spezifizierten maximalen kumulativen Anzahl von Betätigungszyklen, während der das Werkzeug betriebsfähig ist;
wenn die gezählte kumulative Anzahl von Betätigungszyklen größer als die spezifizierte maximale kumulative Anzahl von Betätigungszyklen ist, während der das Werkzeug betriebsfähig sein darf, Bewirken, dass die elektronischen Verriegelungsvorkehrungen (160) den Werkzeugbetrieb deaktivieren.

10. Verfahren zum Regeln der Verwendung eines Werkzeugs (20), das Verfahren umfassend:

Bereitstellen eines Systems (10), das (i) eine Registrierungs- und Steuerkomponente (40), (ii) mindestens eine mobile Vorrichtung (30) und (iii) mindestens ein Werkzeug, das Kommunikationsvorkehrungen (40) und elektronische Verriegelungsvorkehrungen (160) beinhaltet, beinhaltet;
dadurch gekennzeichnet, dass das Verfahren ferner die folgenden Schritte umfasst:

Spezifizieren einer maximalen Menge an kumulativer Zeit, während der das Werkzeug betriebsfähig ist, und einer maximalen kumulativen Anzahl von Betätigungszyklen, während der das Werkzeug betriebs-

fähig ist;
Speichern der spezifizierten maximalen Menge an kumulativer Zeit, während der das Werkzeug betriebsfähig ist, und der maximalen kumulativen Anzahl von Betätigungszyklen, während der das Werkzeug betriebsfähig ist, in Datenspeichervorkehrungen (120) des Werkzeugs;
während des Werkzeugbetriebs Messen einer kumulativen Zeit des Werkzeugbetriebs und Zählen einer kumulativen Anzahl von Betätigungszyklen;
Vergleichen der gemessenen kumulativen Zeit des Werkzeugbetriebs mit der spezifizierten maximalen Menge an kumulativer Zeit, während der das Werkzeug betriebsfähig sein darf, und Vergleichen der kumulativen Anzahl von Betätigungszyklen mit der spezifizierten maximalen kumulativen Anzahl von Betätigungszyklen, während der das Werkzeug betriebsfähig sein darf;
wenn ein erstes Auftreten von (a) der gemessenen kumulativen Zeit des Werkzeugbetriebs größer als die spezifizierte maximale Menge an kumulativer Zeit ist, während der das Werkzeug betriebsfähig sein darf, und (b) der kumulativen Anzahl von Betätigungszyklen größer als die spezifizierte maximale kumulative Anzahl von Betätigungszyklen ist, während der das Werkzeug betriebsfähig sein darf, Bewirken, dass die elektronischen Verriegelungsvorkehrungen (160) den Werkzeugbetrieb deaktivieren.

11. Verfahren nach Anspruch 10, wobei, wenn während des Werkzeugbetriebs das erste Auftreten von (a) und (b) auftritt, die elektronischen Verriegelungsvorkehrungen (160) den Werkzeugbetrieb deaktivieren, nachdem die Werkzeugverwendung unterbrochen wurde.

12. System (10) zum Regeln der Verwendung eines Werkzeugs (20), das System umfassend:

eine Registrierungs- und Steuerkomponente (40), die Datenspeichervorkehrungen und Kommunikationsvorkehrungen aufweist;
mindestens eine mobile elektronische Vorrichtung (30), die Datenspeichervorkehrungen, Kommunikationsvorkehrungen, Benutzerschnittstellenvorkehrungen und Steuervorkehrungen beinhaltet, wobei die mobile Vorrichtung (30) in der Lage ist, mit der Registrierungs- und Steuerkomponente zu kommunizieren, und in der Lage ist, ein Betätigungssignal zu übertragen, das einen Betätigungscode beinhaltet;
dadurch gekennzeichnet, dass
ein Werkzeug (20) Datenspeichervorkehrungen (120), Kommunikationsvorkehrungen (130, 140) und betätigbare elektronische Verriegelungsvorkehrungen (160) aufweist, wobei das Werkzeug (20) in der Lage ist, mit der mobilen Vorrichtung (30) zu kommunizieren und das Betätigungssignal von der mobilen Vorrichtung (30) zu empfangen, wobei die elektronischen Verriegelungsvorkehrungen (160) bei Betätigung konfiguriert sind, um den Betrieb des Werkzeugs (20) bei Empfang des Betätigungscodes zu ermöglichen, wobei
das System (10) so konfiguriert ist, dass bei Kommunikation zwischen der mobilen Vorrichtung (30) und der Registrierungs- und Steuerkomponente (40) die Registrierungs- und Steuerkomponente (40) ein einmaliges Aktivierungssignal an die mobile Vorrichtung (30) ausgibt, wodurch die Kommunikation zwischen der mobilen Vorrichtung (30) und dem Werkzeug (20) ermöglicht wird, um das Aktivierungssignal an das Werkzeug (20) weiterzuleiten.

13. System (10) nach Anspruch 12, wobei die aktivierbaren elektronischen Verriegelungsvorkehrungen (160) des Werkzeugs (20) anfänglich in einem deaktivierten Zustand bereitgestellt werden, wodurch der Werkzeugbetrieb ermöglicht wird.

14. System (10) nach Anspruch 13, wobei das Werkzeug (20) ferner visuelle Zeichen (20c) beinhaltet, die angeben, dass das Werkzeug (20) elektronische Verriegelungsvorkehrungen (160) beinhaltet, wobei vorzugsweise die visuellen Zeichen (20c) in Form eines an dem Werkzeug (20) befestigten Etiketts vorliegen.

Revendications

1. Un procédé pour piloter l'utilisation d'un outil (20), le procédé comprenant :

l'obtention d'un système (10) comprenant (i) un composant d'enregistrement et de contrôle (40), (ii) au moins un dispositif mobile (30), et (iii) au moins un outil (20) comprenant des fonctionnalités de communication et des fonctionnalités de verrouillage électronique ;
l'enregistrement de l'outil (20) dans le composant d'enregistrement et le contrôle (40) ;
la sélection d'au moins un paramètre pour piloter le fonctionnement de l'outil ;
la transmission à l'outil (20) du paramètre pour piloter le fonctionnement de l'outil ;
de sorte que l'outil (20) reste opérationnel jusqu'à ce qu'il soit désactivé sur la base du paramètre sélectionné et en l'absence de réception

d'un signal de désactivation ;
caractérisé en ce que le paramètre pour piloter le fonctionnement de l'outil est choisi dans le groupe constitué par (i) un niveau maximal de temps cumulé pendant lequel l'outil est opérationnel, (ii) un nombre maximal cumulé de cycles d'actionnement pendant lesquels l'outil est opérationnel, (iii) des combinaisons de (i) et de (ii), et (iv) une date d'expiration jusqu'à laquelle et pendant laquelle l'utilisation de l'outil est autorisée.

2. Le procédé de la revendication 1 comprenant en outre :
avant de désactiver l'outil (20) sur la base du paramètre sélectionné, la délivrance d'un signal de rappel pour avertir de la désactivation prochaine de l'outil.

3. Le procédé de l'une des revendications 1 à 2 comprenant en outre :
l'envoi à un destinataire d'un message, dans lequel le message comprend une information relative au fonctionnement de l'outil.

4. Le procédé de l'une des revendications 1 à 3 dans lequel l'outil (20) comprend en outre des fonctionnalités de stockage électronique de données (120) embarquées dans l'outil, et le procédé comprend en outre :

le recueil de données relatives à l'utilisation de l'outil et le stockage des données dans les fonctionnalités de stockage électronique de données (120),
de préférence comprenant en outre :
la transmission au dispositif mobile (30) des données stockées relatives à l'utilisation de l'outil, chaque fois qu'une connexion est établie entre l'outil (20) et le dispositif mobile (30).

5. Un procédé pour piloter l'utilisation d'un outil (20), le procédé comprenant :

l'obtention d'un système (10) comprenant (i) un composant d'enregistrement et de contrôle (40), (ii) au moins un dispositif mobile (30), et (iii) au moins un outil (20) comprenant des fonctionnalités de stockage de données (120), des fonctionnalités de communication (140, 150) et des fonctionnalités de verrouillage électronique (160) ;
caractérisé en ce que le procédé comprend en outre les étapes de :

spécification d'un niveau maximal de temps cumulé pendant lequel l'outil est opérationnel,
stockage, dans les fonctionnalités de stockage de données (120) de l'outil, du niveau maximal spécifié de temps cumulé pendant lequel l'outil est opérationnel ;
remise à zéro d'une temporisation, en faisant ainsi en sorte que les fonctionnalités de verrouillage électronique (160) activent le fonctionnement de l'outil ;
pendant le fonctionnement de l'outil, mesure d'un temps cumulé de fonctionnement de l'outil ;
comparaison du temps cumulé mesuré du fonctionnement de l'outil avec le niveau maximal spécifié de temps cumulé pendant lequel l'outil est autorisé à être opérationnel ;
lorsque le temps cumulé mesuré de fonctionnement de l'outil devient supérieur au niveau maximal spécifié de temps cumulé pendant lequel l'outil est autorisé à être opérationnel, faire en sorte que les fonctionnalités de verrouillage électronique (160) désactivent le fonctionnement de l'outil.

6. Le procédé de la revendication 5 dans lequel le niveau maximal de temps cumulé pendant lequel l'outil est opérationnel est compris dans une plage allant de 24 heures à 6 mois.

7. Le procédé de la revendication 5 ou 6 dans lequel l'au moins un dispositif mobile (30) est susceptible de communiquer avec le composant d'enregistrement et de contrôle (40), de préférence dans lequel la communication entre le dispositif (30) et le composant d'enregistrement et de contrôle (40) comprend une infrastructure basée dans le cloud (50).

8. Le procédé de l'une des revendications 5 à 7 comprenant en outre :
après que les fonctionnalités de verrouillage électronique (160) ont désactivé le fonctionnement de l'outil, la transmission d'un signal pour remettre à zéro la temporisation et choisir un nouveau paramètre pour l'outil (20) en faisant ainsi en sorte que les fonctionnalités de verrouillage électronique (160) activent le fonctionnement de l'outil, la transmission du signal pour remettre à zéro la temporisation et choisir à nouveau un paramètre étant de préférence opérée par au moins un dispositif mobile (30).

9. Un procédé pour piloter l'utilisation d'un outil (20), le procédé comprenant :

l'obtention d'un système (10) comprenant (i) un composant d'enregistrement et de contrôle (40), (ii) au moins un dispositif mobile (30), et (iii) au moins un outil (20) comprenant des fonctionna-

lités de stockage de données (120), des fonctionnalités de communication (140, 150) et des fonctionnalités de verrouillage électronique (160) ;
caractérisé en ce que le procédé comprend en outre les étapes de :

spécification d'un nombre cumulé maximal de cycles d'actionnement pendant lesquels l'outil est opérationnel ;
stockage, dans les fonctionnalités de stockage de données (120) de l'outil (20), du nombre cumulé maximal spécifié de cycles d'actionnement pendant lesquels l'outil est opérationnel ;
remise à zéro d'un compteur en faisant ainsi en sorte que les fonctionnalités de verrouillage électronique (160) activent le fonctionnement de l'outil ;
pendant le fonctionnement de l'outil, comptage d'un nombre cumulé de cycles d'actionnement ;
comparaison du nombre cumulé compté de cycles d'actionnement avec le nombre cumulé maximum spécifié de cycles d'actionnement pendant lesquels l'outil est opérationnel ;
lorsque le nombre cumulé compté de cycles d'actionnement devient supérieur au nombre cumulé maximal spécifié de cycles d'actionnement pendant lesquels l'outil est autorisé à être opérationnel, faire en sorte que les fonctionnalités de verrouillage électronique (160) désactivent le fonctionnement de l'outil.

10. Un procédé pour piloter l'utilisation d'un outil (20), le procédé comprenant :

l'obtention d'un système (10) comprenant (i) un composant d'enregistrement et de contrôle (40), (ii) au moins un dispositif mobile (30), et (iii) au moins un outil (20) comprenant des fonctionnalités de communication (140) et des fonctionnalités de verrouillage électronique (160) ;
caractérisé en ce que le procédé comprend en outre les étapes de :

spécification d'un niveau maximum de temps cumulé pendant lequel l'outil est opérationnel et d'un nombre cumulé maximal de cycles d'actionnement pendant lesquels l'outil est opérationnel ;
stockage, dans des fonctionnalités de stockage de données (120) de l'outil, du montant maximal spécifié de temps cumulé pendant lequel l'outil est opérationnel et
du nombre cumulé maximal de cycles d'actionnement pendant lesquels l'outil est opérationnel ;
pendant le fonctionnement de l'outil, mesure d'un temps cumulé de fonctionnement de l'outil et comptage d'un nombre cumulé de cycles d'actionnement ;
comparaison du temps cumulé mesuré de fonctionnement de l'outil avec le niveau maximal spécifié de temps cumulé pendant lequel l'outil est autorisé à être opérationnel, et comparaison du nombre cumulé de cycles d'actionnement avec le nombre cumulé maximal spécifié de cycles d'actionnement pendant lequel l'outil est autorisé à être opérationnel ;
à la première survenue d'entre (a) le temps cumulé mesuré de fonctionnement de l'outil qui est supérieur à la quantité maximale spécifiée de temps cumulé pendant lequel l'outil est autorisé à être opérationnel, et (b) le nombre cumulé de cycles d'actionnement qui est supérieur au nombre cumulé maximal spécifié de cycles d'actionnement pendant lesquels l'outil est autorisé à être opérationnel, faire en sorte que les fonctionnalités de verrouillage électronique (160) désactivent le fonctionnement de l'outil.

11. Le procédé de la revendication 10 dans lequel, si pendant le fonctionnement de l'outil la première survenue de (a) et (b) survient, les fonctionnalités de verrouillage électronique (160) désactivent le fonctionnement de l'outil après qu'il a été mis fin à l'utilisation de l'outil.

12. Un système (10) pour piloter l'utilisation d'un outil (20), le système comprenant :

un composant d'enregistrement et de contrôle (40) avec des fonctionnalités de stockage de données et des fonctionnalités de communication ;
au moins un dispositif électronique mobile (30) comprenant des fonctionnalités de stockage de données, des fonctionnalités de communication, des fonctionnalités d'interface utilisateur, et des fonctionnalités de contrôle, le dispositif mobile (30) étant capable de communiquer avec le composant d'enregistrement et de contrôle, et capable de transmettre un signal d'actionnement qui comprend un code d'actionnement ;
un outil (20) avec des fonctionnalités de stockage de données (120), des fonctionnalités de communication (130, 140), et des fonctionnalités de verrouillage électronique actionnables (160), l'outil (20) étant capable de communiquer avec le dispositif mobile (30) et de recevoir le

signal d'actionnement en provenance du dispositif mobile (30), les fonctionnalités de verrouillage électronique (160) étant configurées pour autoriser, lorsqu'elles sont actionnées, le fonctionnement de l'outil (20) sur réception du code d'actionnement,
caractérisé en ce que le système (10) est configuré de telle manière que, sur une communication entre le dispositif mobile (30) et le composant d'enregistrement et de contrôle (40), le composant d'enregistrement et de contrôle (40) délivre un unique signal d'activation au dispositif mobile (30), activant ainsi une communication entre le dispositif mobile (30) et l'outil (20) pour relayer à l'outil (20) le signal d'activation.

13. Le système (10) selon la revendication 12 dans lequel les fonctionnalités de verrouillage électronique activables (160) de l'outil (20) sont initialement mises dans un état désactivé, autorisant ainsi un fonctionnement de l'outil.

14. Le système (10) selon la revendication 13 dans lequel l'outil (20) comprend en outre une indication visuelle (20c) indiquant que l'outil (20) inclut des fonctionnalités de verrouillage électronique (160), de préférence dans lequel l'indication visuelle (20c) est sous forme d'une étiquette fixée sur l'outil (20).

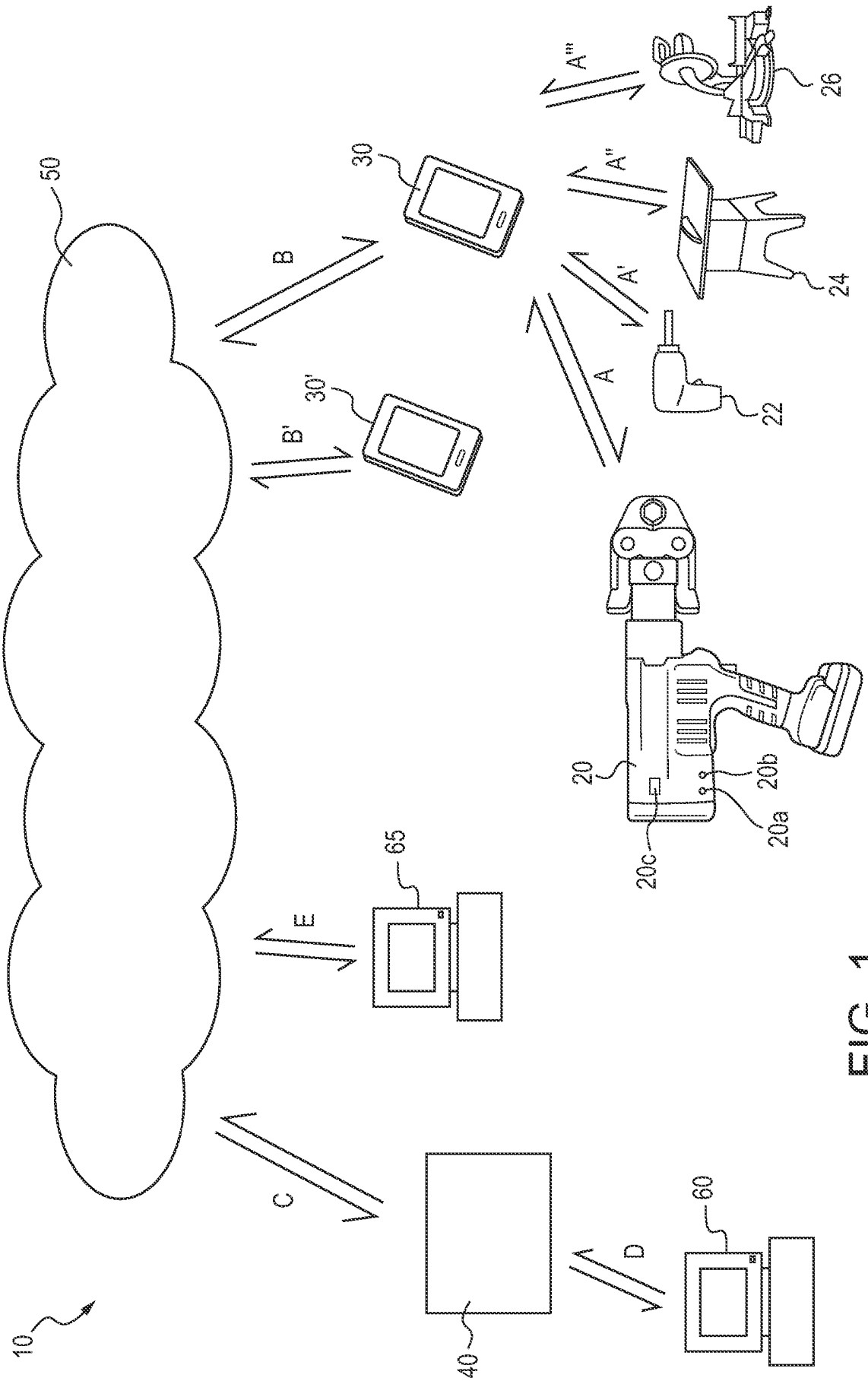

FIG. 1

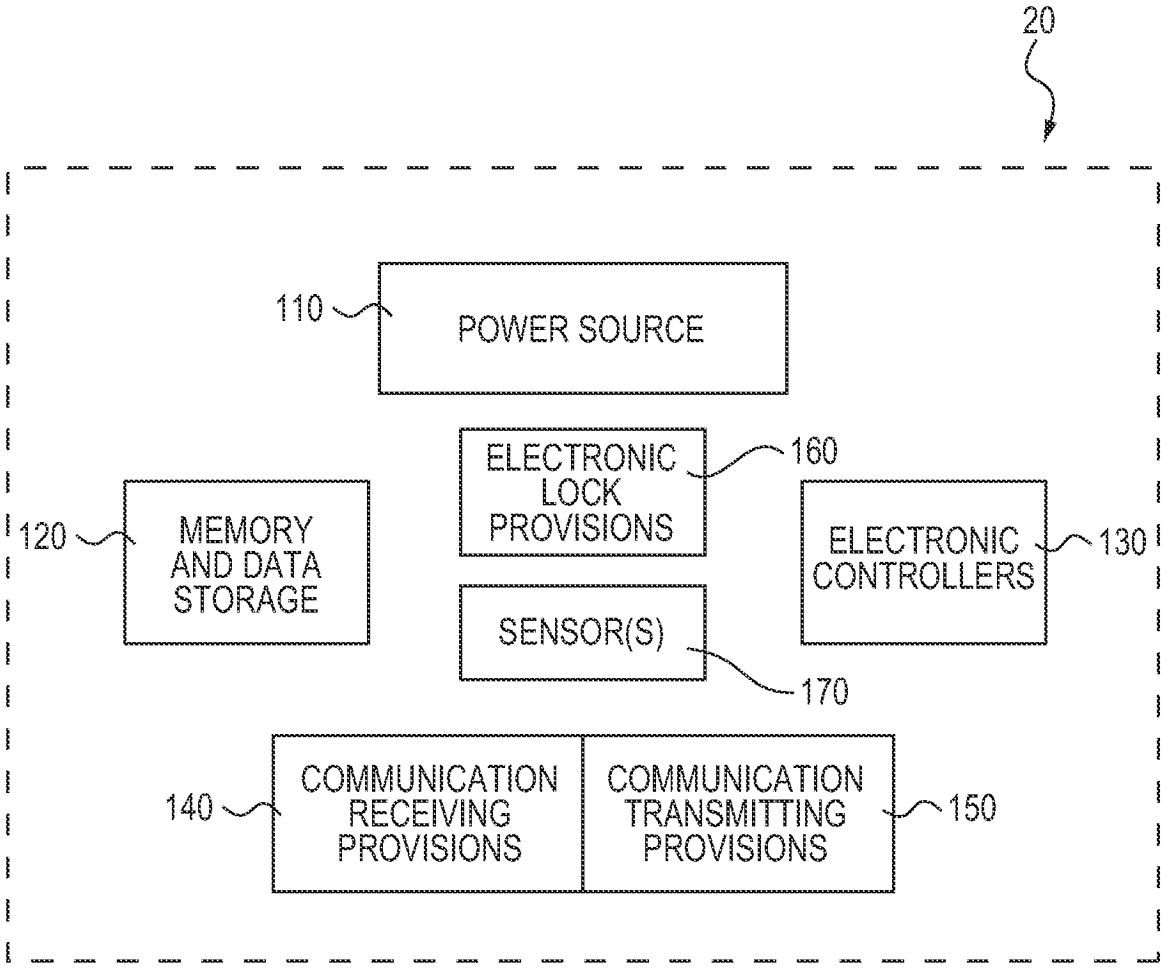
20
110
POWER SOURCE
ELECTRONIC LOCK PROVISIONS
160
120
MEMORY AND DATA STORAGE
ELECTRONIC CONTROLLERS
130
SENSOR(S)
170
140
COMMUNICATION RECEIVING PROVISIONS
COMMUNICATION TRANSMITTING PROVISIONS
150

FIG. 2

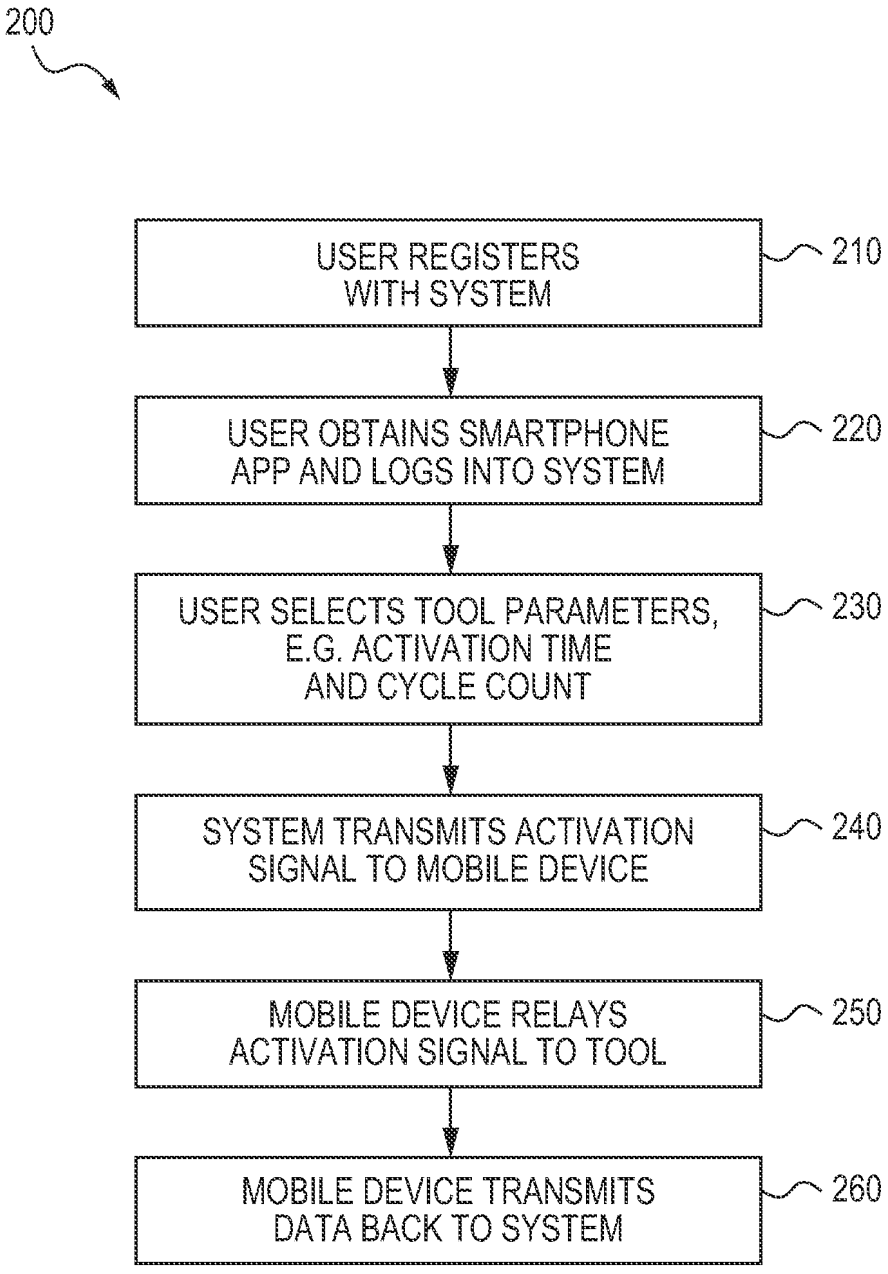
200
USER REGISTERS WITH SYSTEM
210
USER OBTAINS SMARTPHONE APP AND LOGS INTO SYSTEM
220
USER SELECTS TOOL PARAMETERS, E.G. ACTIVATION TIME AND CYCLE COUNT
230
SYSTEM TRANSMITS ACTIVATION SIGNAL TO MOBILE DEVICE
240
MOBILE DEVICE RELAYS ACTIVATION SIGNAL TO TOOL
250
MOBILE DEVICE TRANSMITS DATA BACK TO SYSTEM
260

FIG. 3

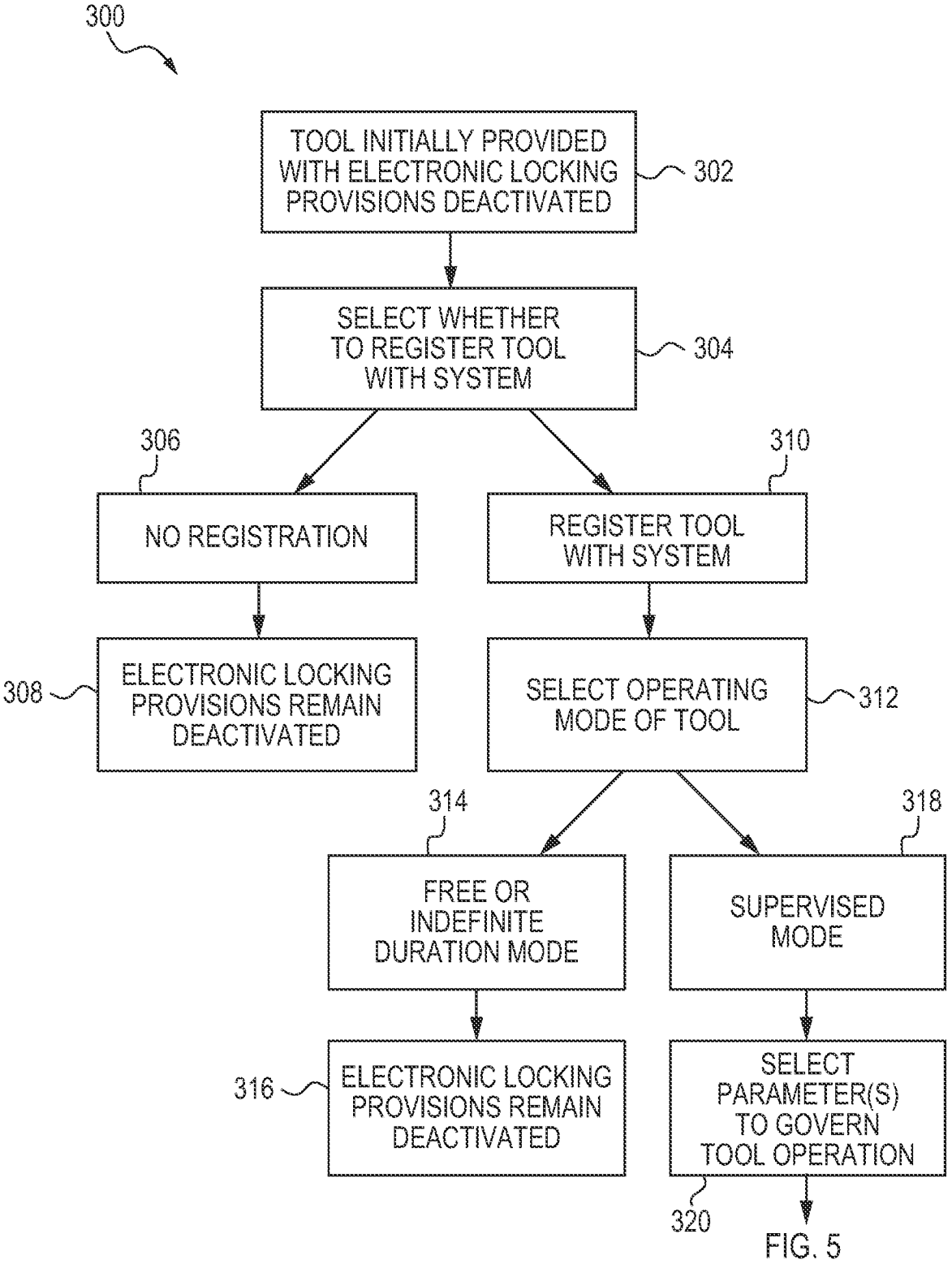
300
TOOL INITIALLY PROVIDED WITH ELECTRONIC LOCKING PROVISIONS DEACTIVATED
302
SELECT WHETHER TO REGISTER TOOL WITH SYSTEM
304
306
NO REGISTRATION
310
REGISTER TOOL WITH SYSTEM
308
ELECTRONIC LOCKING PROVISIONS REMAIN DEACTIVATED
SELECT OPERATING MODE OF TOOL
312
314
FREE OR INDEFINITE DURATION MODE
318
SUPERVISED MODE
316
ELECTRONIC LOCKING PROVISIONS REMAIN DEACTIVATED
SELECT PARAMETER(S) TO GOVERN TOOL OPERATION
320

FIG. 5

FIG. 4

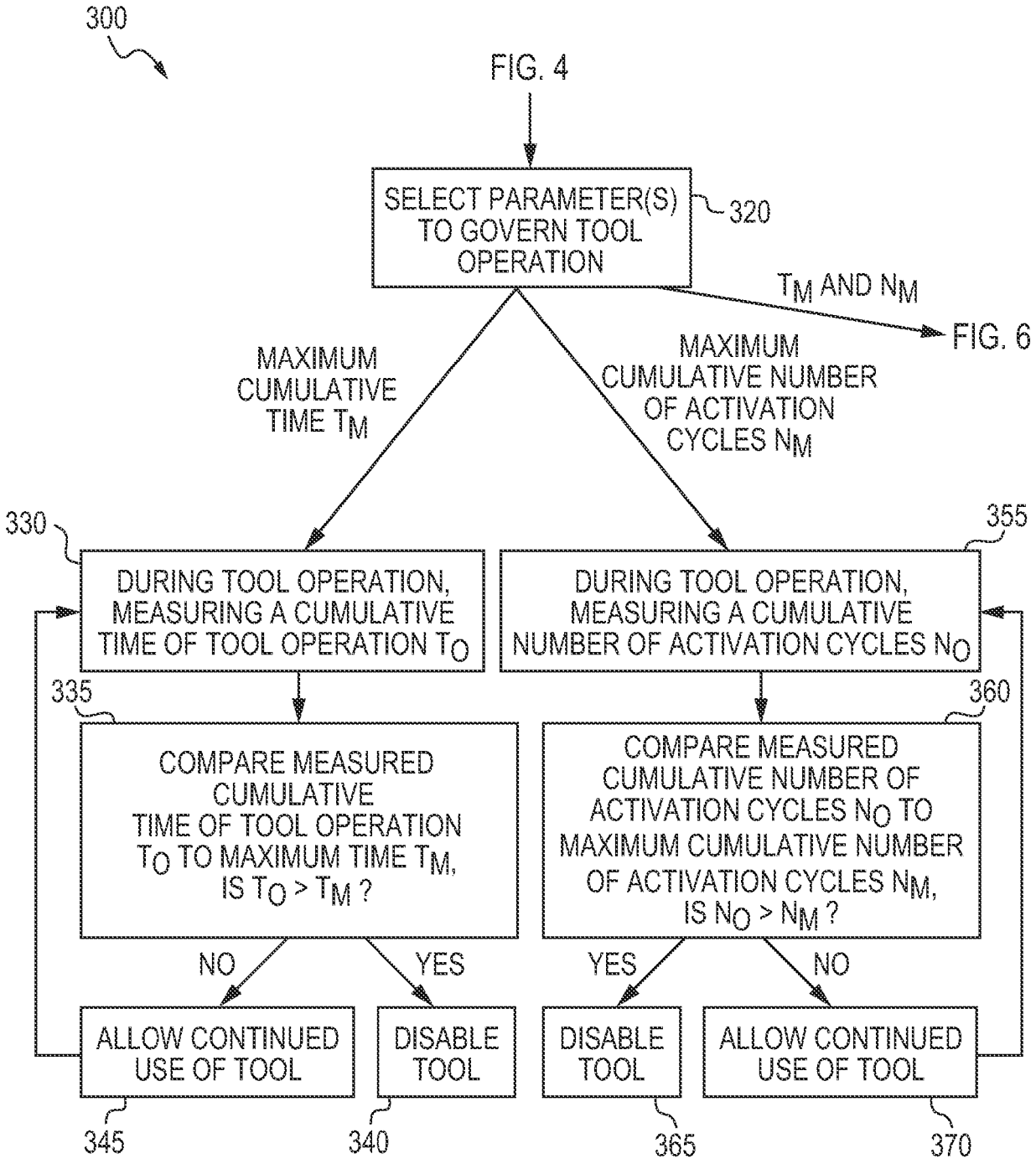
300
FIG. 4
SELECT PARAMETER(S) TO GOVERN TOOL OPERATION
320
T_M AND N_M
FIG. 6
MAXIMUM CUMULATIVE TIME T_M
MAXIMUM CUMULATIVE NUMBER OF ACTIVATION CYCLES N_M
330
355
DURING TOOL OPERATION, MEASURING A CUMULATIVE TIME OF TOOL OPERATION T_O
DURING TOOL OPERATION, MEASURING A CUMULATIVE NUMBER OF ACTIVATION CYCLES N_O
335
360
COMPARE MEASURED CUMULATIVE TIME OF TOOL OPERATION T_O TO MAXIMUM TIME T_M, IS $T_O > T_M$?
COMPARE MEASURED CUMULATIVE NUMBER OF ACTIVATION CYCLES N_O TO MAXIMUM CUMULATIVE NUMBER OF ACTIVATION CYCLES N_M, IS $N_O > N_M$?
NO
YES
YES
NO
ALLOW CONTINUED USE OF TOOL
DISABLE TOOL
DISABLE TOOL
ALLOW CONTINUED USE OF TOOL
345
340
365
370

FIG. 5

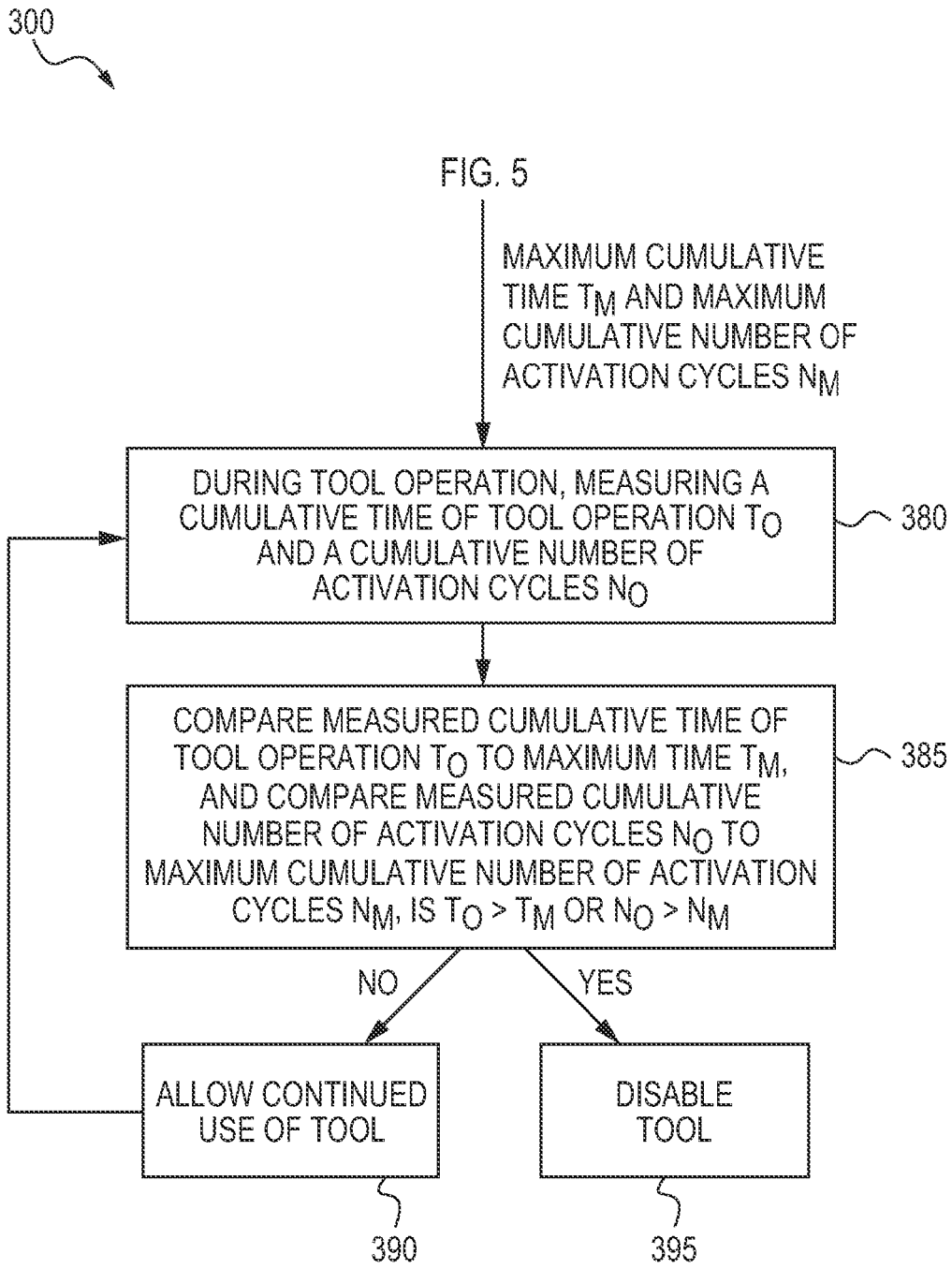
300
MAXIMUM CUMULATIVE TIME T_M AND MAXIMUM CUMULATIVE NUMBER OF ACTIVATION CYCLES N_M
DURING TOOL OPERATION, MEASURING A CUMULATIVE TIME OF TOOL OPERATION T_O AND A CUMULATIVE NUMBER OF ACTIVATION CYCLES N_O
380
COMPARE MEASURED CUMULATIVE TIME OF TOOL OPERATION T_O TO MAXIMUM TIME T_M, AND COMPARE MEASURED CUMULATIVE NUMBER OF ACTIVATION CYCLES N_O TO MAXIMUM CUMULATIVE NUMBER OF ACTIVATION CYCLES N_M, IS $T_O > T_M$ OR $N_O > N_M$
385
NO
YES
ALLOW CONTINUED USE OF TOOL
DISABLE TOOL
390
395

FIG. 6

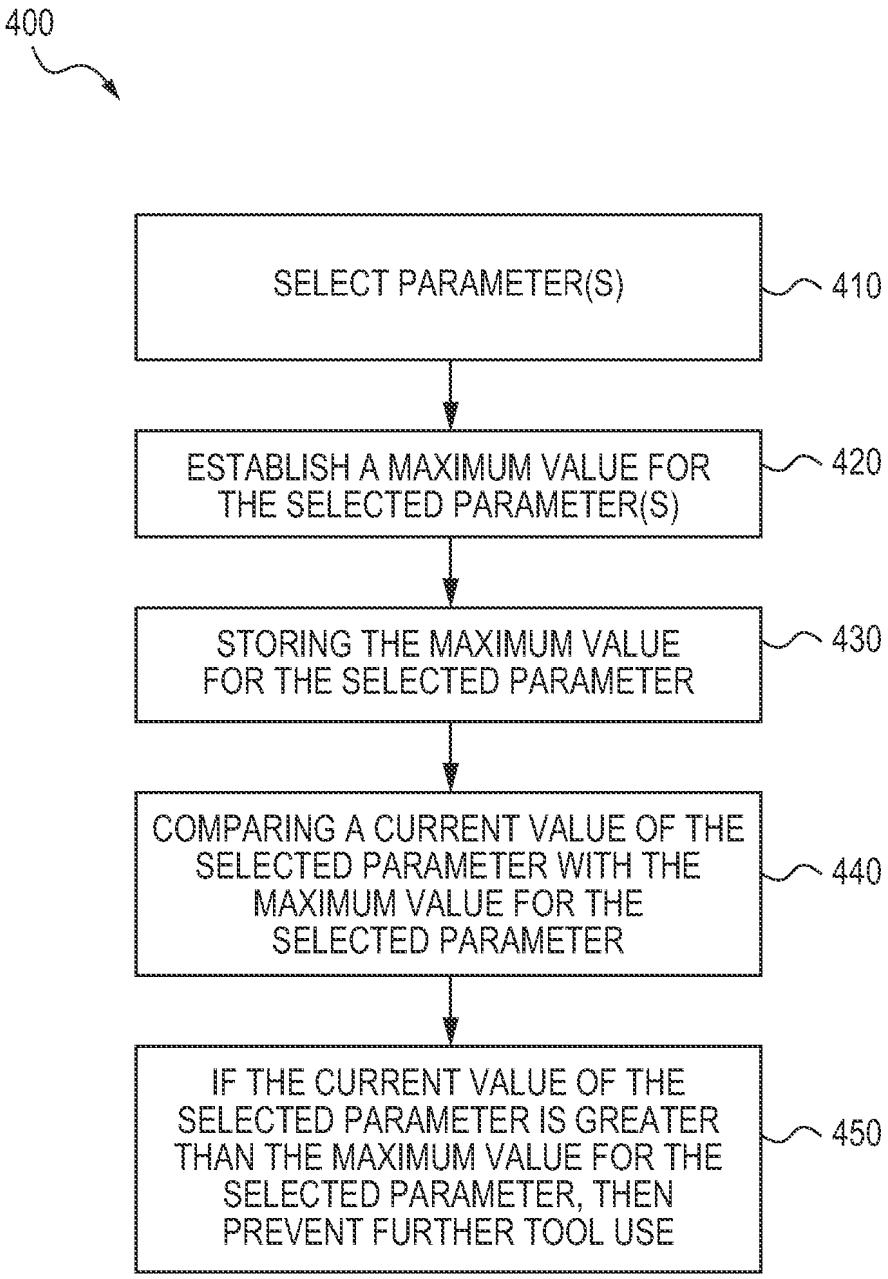
400
SELECT PARAMETER(S)
410
ESTABLISH A MAXIMUM VALUE FOR THE SELECTED PARAMETER(S)
420
STORING THE MAXIMUM VALUE FOR THE SELECTED PARAMETER
430
COMPARING A CURRENT VALUE OF THE SELECTED PARAMETER WITH THE MAXIMUM VALUE FOR THE SELECTED PARAMETER
440
IF THE CURRENT VALUE OF THE SELECTED PARAMETER IS GREATER THAN THE MAXIMUM VALUE FOR THE SELECTED PARAMETER, THEN PREVENT FURTHER TOOL USE
450

FIG. 7

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 61973932 **[0001]**
- US 66508815 **[0001]**
- WO 2013063507 A1 **[0002] [0008]**
- US 7298240 B **[0005]**
- EP 2680093 A2 **[0008]**
- US 2009138116 A1 **[0008]**
- WO 2013141868 A **[0025]**
- US 20120060165 A **[0025]**
- WO 2013119247 A **[0025]**
- US 20110153868 A **[0025]**
- US 8549656 B **[0033]**
- US 20130122861 A **[0033]**
- WO 2013163249 A **[0033]**
- WO 2012155937 A **[0033]**