Title: PORTABLE POWER TOOL WITH WIRELESS COMMUNICATION WITH A STATIONARY CONTROL UNIT

Abstract: A portable power tool with wireless communication with a stationary control unit for exchange of operation parameter values comprises housing (10) with a battery powered motor connected to an output shaft, an on-board operation control means, and a wireless communication means in the form of a communication module (22), wherein the communication module (22) is received in a docking portion (23) on the housing (10), and the docking portion (23) and the communication module (22) have matching electric connection means (25,26). The communication module (22) is one of a number of exchangeable communication modules (22a-c) all having identical electric connection means (25,26) for co-operation with the connection means of the docking portion (23) but comprise means for wireless communication according to different communication systems.
Portable power tool with wireless communication with a stationary control unit.

The invention relates to a portable power tool for performing working operations according to certain operation parameter values, wherein desired parameter values and obtained working operation results are communicated between the power tool and a stationary process control unit via a wireless communication system.

Power tools of this type, mainly battery powered power wrenches with no cable connection with the process control unit, have a growing application in assembly line operations, for instance in assembling of automobile bodies and the like. This type of tools has become increasingly more advanced with on-board operation control means and wireless transmission of operation data between the on-board operation control means and a stationary process control unit. This communication is performed via different wireless systems, like W-lan, Bluetooth etc. according to what particular system is preferred by the actual operator.

A problem concerned with this type of power tool is that the tools produced today are specifically designed to operate according to one specific communication system, and if a tool has to be adapted to another communication system there is required a difficult and time consuming operation to redesign the tool, i.e. changing the transmitting/receiving means according to one system originally fitted to the power tool to another transmitting/receiving means. That operation normally requires a certain amount of work for dismantling and reassembling the power tool to get access to and remove the transmitting/receiving means and to enable fitting of an alternative equipment. This is a tricky and time consuming operation which causes undesired extra costs to the operator.
An alternative way to change communication system is to exchange the entire power tool for another tool provided with the desired communication system. This also means an increased cost, because the power tool supplier has to specifically design a number of power tool models with different communication systems, which adds to the costs for keeping an increased number of tools in stock.

The present invention provides a power tool adaptable for wireless communication with a stationary process control unit in accordance with different communication systems in that the wireless transmitting/receiving means on-board the power tool is easily and readily exchanged for a transmitting/receiving means operating in accordance with an alternative communication system.

Further characteristic features and advantages of the invention will appear from the following specification and claims.

A preferred embodiment of the invention is below described in detail with reference to the accompanying drawing.

In the drawing
Fig. 1 shows a perspective view of a power tool according to the invention.
Fig. 2 shows a perspective view of the power tool in Fig. 1 illustrating alternative separate communication modules.

The power tool illustrated in the drawings is a battery powered angle nutrunner which comprises a housing 10 formed with external grip sections 11, 12 for manual support of the tool during work operations. At its forward end the housing 10 is provided with an angle head 14 with an output shaft 15, and at its rear end the housing 10 carries an exchangeable and rechargeable battery unit 16. Inside the
housing 10 there is supported an electric motor which is
drivingly connected to the output shaft 15, and a key 17 is
provided on the housing 10 for the operator to initiate the
power supply to the motor.

The power tool also comprises an on-board operation control
means (not illustrated) for controlling the operation of
the motor in accordance with certain parameter values, like
target torque level, and a wireless communication system is
arranged to communicate operation data between the power
tool and a stationary control unit 20. This communication
system comprises a transmitter/receiver on-board the power
tool and a transmitter/receiver in the stationary control
unit 20, both operating according to the same communication
system, for instance Bluetooth, W-lan etc. The results of
each performed screw joint tightening process, like the
actually obtained torque level, the lapsed rotation angle
of the output shaft during the final tightening, and other
data like for instance the remaining battery capacity,
motor temperature etc. are communicated back to the control
unit 20, whereas power tool operation data as tightening
parameter values to be used during tightening of a certain
screw joint are communicated from the control unit 20 to
the power tool.

The communication means comprising a transmitter/receiver
on-board the power tool has the form of a separate
communication module 22 which is connected to the tool via
a docking portion 23 on the housing 10. The latter has the
form of a pocket in which the main part of the
communication module 22 is received, and the communication
module 22 and the docking portion 23 comprise matching
connection means 25,26 for electrically connect the
communication module 22 to the on-board operation control
means as the communication module 22 is docked to the power
tool. The connection means 25,26 on the communication
module 22 comprises a pair of rigidly attached connector elements.

The communication module 22 is one of a number of interchangeable communication modules 22 a-c all comprising means for wireless communication according to different communication systems, like Bluetooth, W-Ian etc. This means that one power tool can easily be adapted to different communication systems, just by exchanging communication module. No dismantling/reassembly work is needed, and the number of power tool models kept available to the customers could be minimized. It is crucial though that the alternative communication modules 22a-c comprise identical connection means 25,26 for co-operation with the connection means of the docking portion 23.

It is to be considered that the embodiments of the invention are not limited to the illustrated and described example but may be freely varied within the scope of the claims. Accordingly, the docking portion 23 on the power tool housing 10 may have other forms than a pocket, and the connection means between the communication module 22 and the docking portion 23 may have different forms, like male/female plug/jack type or sheet metal contact strips.
Claims.

1. Portable power tool having means for wireless communication with a stationary process control unit (20), comprising a housing (10), a motor, an on-board operation control means, and a wireless communication means for communicating tool operation data between the on-board control means and the stationary process control unit, characterized in that the on-board wireless communication means is formed as a separate communication module (22a-c), and a docking portion (23) is formed on the housing (10) for receiving and firmly retaining said communication module (22a-c), said docking portion (23) and said communication module (22a-c) have matching electric connection means to be interengaged as said communication module (22a-c) is received by said docking portion (23), thereby connecting said communication module (22a-c) with the on-board operation control means.

2. Power tool according to claim 1, wherein said separate communication module (22a-c) is one of a number of interchangeable communication modules all having identical connection means (25,26) but comprising communication means for operation according to different wireless communication systems.

3. Power tool according to claim 1 or 2, wherein said docking portion (23) is formed as a pocket for receiving at least partly said communication module (22a-c), and said pocket is provided with said connection means for engaging said connection means on said communication module (22a-c).

4. Power tool according to anyone of claims 1-3, wherein said connection means on said communication module (22a-c) comprises a pair of rigidly attached connector elements (25,26).
A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B23B, B25B, B25F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>(04.10.2001), page 8, line 10 - line 19, figure 6, abstract</td>
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Y document of particular relevance the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Date of the actual completion of the international search: 11 April 2008

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Name and mailing address of the ISA:
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Authorized officer
Katarina Ekman / MRo
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International patent classification (IPC)

**B25B 21/00** (2006.01)
**B23B 45/02** (2006.01)
**B25B 23/147** (2006.01)

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Cited literature, if any, will be enclosed in paper form.
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