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(54) **TOOL FOR MOUNTING HOSE CLAMPS ON A TUBE**

(57) The tool (10) comprises: a motor (12) to generate a torque; a working head (16), removable and movable between an open and a closed configuration for clamping a hose clamp on a tube; transmission means (32), for transmitting torque from the motor (12) to the working head (16); a magnetic element (18) and proximity sensing means (20); an electronic control unit (22) to control the torque of the motor (12) as a function of a signal from the proximity sensing means (20); and a pair

of control buttons (38) for transmitting a signal to the electronic control unit (22), arranged so that an operator must use both hands to activate the buttons simultaneously, and wherein the electronic control unit (22) commands the motor (12) to generate a first torque when only one of the buttons of the pair of control buttons (38) is activated, and to generate a second torque when both buttons of the pair of control buttons (38) are activated, wherein the second torque is greater than the first torque.

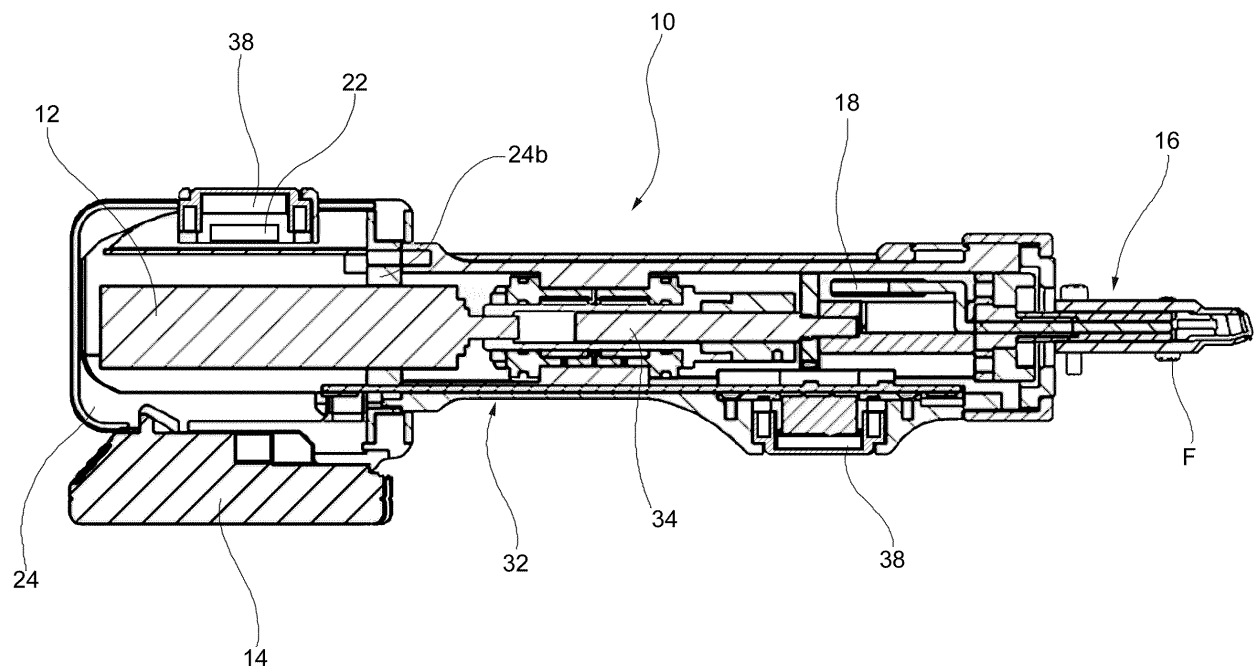


FIG. 2

Description

[0001] This invention generally relates to a smart tool for mounting hose clamps on a tube, a conduit or similar structure.

[0002] Generally, a known tool for mounting clamps on hoses comprises: a power source adapted to supply electrical or pneumatic power, a working head, adapted to use this power to move between an open configuration, in which it is suitable to receive a hose clamp, and a closed configuration, in which it is suitable to clamp said hose clamp on a tube; and transmission means interposed between said power source and said working head, and adapted to transmit said power to the working head to drive its movement between the open configuration and the closed configuration.

[0003] The tools for mounting hose clamps according to the prior art have various problems.

[0004] First, it is necessary to supply electrical power to the motor of the tool via a power cable, or it is necessary to supply pneumatic power to the tool via a pneumatic conduit. In any case, the presence of electric power supply cables or pneumatic power supply hoses, although often made in flexible form, constitutes a problem in terms of space and safety for the operator using the tool.

[0005] Furthermore, in tools according to the prior art, it is not possible to precisely control the clamping process, and therefore there is a risk of the hose clamps being clamped or mounted incorrectly, or of hose clamps of an unsuitable type or size being mounted on a tube, or of the operator being injured while using the tool.

[0006] Lastly, generally the tools according to the prior art are specifically made for use with a specific type or size of hose clamps, and therefore cannot be used to mount hose clamps of different types or sizes.

[0007] An object of this invention is to provide a tool for mounting hose clamps which does not suffer from the drawbacks of the prior art, and which has a better durability and reliability.

[0008] This and other objects are fully achieved according to this invention by virtue of a tool as defined in the appended independent claim 1.

[0009] Advantageous embodiments of the invention are specified in the dependent claims, the content of which is to be understood as an integral and integrating part of the following description.

[0010] In short, the invention is based on the idea of providing a tool for mounting hose clamps on a tube, comprising:

an electric motor adapted to generate a driving torque;
a working head, removably mounted on the tool, and adapted to move between an open configuration, in which it is adapted to receive a hose clamp, and a closed configuration, in which it is adapted to clamp said hose clamp onto a tube;
transmission means, interposed between said elec-

tric motor and said working head, adapted to transmit said driving torque generated by the electric motor to said working head to drive the movement of the working head between the open configuration and the closed configuration;

a magnetic element and proximity sensing means, the proximity sensing means being adapted to generate a proximity signal when the relative distance between the magnetic element and the proximity sensing means is less than a predetermined distance of measure;

an electronic control unit configured to control the driving torque generated by the electric motor as a function of said proximity signal generated by the proximity sensing means,
the tool further comprising a pair of control buttons adapted to transmit a command signal to the electronic control unit,

wherein the pair of control buttons is arranged and constructed in such a way that an operator must use both hands to activate them simultaneously, and wherein the electronic control unit is configured to command the generation of the driving torque by the electric motor according to a control logic comprising the following steps:

- when only one of the buttons of the pair of control buttons is activated, the electronic control unit commands the generation of a first driving torque by the electric motor;
- when both buttons of the pair of control buttons are activated, the electronic control unit commands the generation of a second driving torque by the electric motor, wherein the second driving torque is greater than the first driving torque.

[0011] Preferably, the tool further comprises at least one battery adapted to supply electric power to the electric motor.

[0012] Preferably, the magnetic element is arranged integral with the transmission means and adapted to be drawn by said transmission means between a first position, wherein the working head is in the open configuration, and a second position, wherein the working head is in the closed configuration.

[0013] Preferably, moreover, the proximity sensing means comprise a pair of sensors, in particular a first proximity sensor and a second proximity sensor, each adapted to generate a respective proximity signal when the relative distance between the magnetic element and, respectively, the first proximity sensor or the second proximity sensor, is less than a predetermined distance of measure.

[0014] By virtue of such a tool, it is possible to overcome the drawbacks of the prior art mentioned above, and to provide a more reliable and safe mounting procedure.

[0015] Further features and advantages of this inven-

tion will be clarified by the detailed description that follows, given purely by way of non-limiting example in reference to the accompanying drawings, wherein:

Fig. 1 is a bottom view of a tool for mounting hose clamps according to an embodiment of the invention; Fig. 2 is a side sectional view of the tool of Fig. 1, on a section plane perpendicular to the plane of Fig. 1 and passing through the center of the tool; Fig. 3a, 3b and 3c show a detail of the tool of Fig. 1, respectively in an open configuration, in an intermediate configuration, and in a closed configuration, on a section plane parallel to the plane of Fig. 1 and passing through the center of the tool; and Fig. 4 is a schematic view of a mounting system comprising the tool of Fig. 1, a command control box, and a data management system.

[0016] With reference initially to Fig. 1 to 3b, a tool for mounting hose clamps according to this invention is generally indicated with 10.

[0017] The tool 10 essentially comprises an electric motor 12, a working head 16, a magnetic element 18, proximity sensing means 20, an electronic control unit 22, and a frame 24 adapted to support the components of the tool 10, as well as a pair of control buttons 38.

[0018] The electric motor 12 is fixed to the frame 24 by means of a flange of the motor 24b and is adapted to generate a driving torque when powered and when so commanded by the electronic control unit 22. For example, an electric motor 12 suitable for the tool 10 according to the invention may have a power between a few tens of W and about 200 W, for example a power of about 100 W. The dimensions and numerical parameters reported here are purely illustrative and shall not be interpreted in a limiting manner.

[0019] The tool 10 preferably further comprises a battery 14. The battery 14 is adapted to supply electric power to the electric motor 12, and is preferably made as a rechargeable battery, being therefore arranged for recharging through a dedicated electric connector. Alternatively, the battery 14 may be provided as a replaceable battery. For example, a battery 14 suitable for the tool 10 according to the invention may have a capacity between a few tenths of Ah and about 2 Ah, for example a capacity of about 1.3 Ah, and a voltage, for example, of 18 V.

[0020] In an alternative embodiment, the tool 10 is powered by means of an electric power supply cable, in a manner known per se.

[0021] The working head 16 is mounted on the tool 10 in a removable manner, i.e., in a separable way, i.e., able to be disassembled from the frame 24, so as to be able to remove the working head 16 for cleaning or maintenance operations, or even so that it may be replaced entirely in case of damage, or if it is not suitable for the type of hose clamp to be mounted. The connection between the working head 16 and the frame 24 may be provided in different forms, for example through a snap

or bayonet connection, or through a threaded connection, or in any other way suitable for easily removing or replacing the working head 16.

[0022] The working head 16 is adapted to move between an open configuration, in which it is adapted to receive a hose clamp, and a closed configuration, in which it is adapted to clamp said clamp onto a tube.

[0023] In particular, the working head 16 may comprise a pair of clamping elements 26, rotatably mounted, each on a respective fulcrum F. The clamping elements 26 are made in such a way as to have on one side a shape adapted to support and clamp a hose clamp, for example by means of two respective clamps 28, and on the other side to be moved between the open configuration and the closed configuration, for example by means of an internal profile 30 with a curved or beveled shape, as shown in Fig. 3a, 3b and 3c.

[0024] The working head 16, as mentioned, is adapted to move between the open configuration-as shown in Fig. 3a-that is, the configuration wherein it is possible to insert a hose clamp to be mounted, wherein the clamping elements 26 have a maximum relative distance from each other, and the closed configuration-as shown in Fig. 3c-that is, the configuration wherein the hose clamp is clamped on the tube, wherein the clamping elements 26 have a minimum relative distance from each other, passing through a plurality of intermediate configurations, one of which being shown in Fig. 3b.

[0025] The working head 16 is mounted so as to remain normally in the open configuration, for example by means of a torsion spring or other known means.

[0026] The movement of the working head 16 from the open to the closed configuration and vice versa is actuated by the driving torque generated by the electric motor 12. This driving torque is transmitted to the working head 16 by means of the transmission means 32, interposed between the electric motor 12 and the working head 16, in a manner known per se.

[0027] According to a preferred embodiment of the invention, between the electric motor 12 and the transmission means 32 there is also a reduction mechanism, known per se, adapted to multiply suitably the driving torque generated by the electric motor 12 according to the dimensional requirements and design of the tool 10.

[0028] Preferably, the transmission means 32 comprise a worm screw 34, so as to be able to reduce the radial dimensions thereof to the minimum and to be able to convert a rotary motion generated by the electric motor 12 into an axial motion adapted to move the working head 16 between open and closed configurations.

[0029] The transmission means 32 further comprise a thrust element 36 adapted to contact the internal profile 30 of the pair of clamping elements 26, so as to push the working head from the open to the closed configuration. In particular, the thrust element 36 may have a rod shape and be axially slidable, receiving the axial motion transmitted by the worm screw 34.

[0030] As mentioned previously, the tool 10 further

comprises a magnetic element 18 and proximity sensing means 20 adapted to generate a proximity signal when the relative distance between the magnetic element 18 and the proximity sensing means 20 is less than a predetermined distance of measure. The predetermined distance of measure depends on the sensitivity of the proximity sensing means 20 used and corresponds substantially to the distance below which the proximity sensing means 20 are adapted to detect the proximity of an object.

[0031] According to a first embodiment, the magnetic element 18 is arranged integrally with the transmission means 32, while the proximity sensing means 20 are mounted integrally with the frame 24. In an alternative but clearly equivalent embodiment of the invention, the configuration of the magnetic element 18 and of the proximity sensing means 20 is inverted; that is, the proximity sensing means 20 are mounted integral with the transmission means 32 and the magnetic element 18 is permanently mounted on the frame 24. Hereinafter, for the sake of brevity, only the first of these two alternative embodiments will be described in detail, it being understood that the alternative but equivalent embodiment is also included in the scope of the invention.

[0032] The magnetic element 18 may be formed, for example, of a simple bushing or a rod made of ferromagnetic or permanently magnetized material. The magnetic element 18 is drawn by the transmission means 32 throughout the movement between two extreme positions, in particular between a first position, wherein the transmission means 32 are in such a configuration that the working head 16 is in the open configuration, and a second position, wherein the transmission means 32 are in a configuration such that the working head 16 is in the closed configuration. Substantially, the position of the magnetic element 18 depends on the configuration of the working head 16, and, in particular, the first position and the second position of the magnetic element 18 correspond to the two open and closed configurations, respectively.

[0033] The proximity sensing means 20 may be arranged on the frame 24 of the tool 10, whereby they may generate a proximity signal as a function of the relative position of the magnetic element 18 relative to the proximity sensing means 20. In particular, when the relative distance between the proximity sensing means 20 and the magnetic element 18 is less than a predetermined distance of measure, corresponding to the activation distance of the proximity sensing means 20, that is, the maximum distance below which the proximity sensing means 20 are activated, the proximity sensing means 20 generate a proximity signal and transmit it to the electronic control unit 22.

[0034] In particular, the proximity sensing means 20 may comprise induction sensors, or Hall effect sensors.

[0035] Preferably, according to an embodiment of the invention, the proximity sensing means 20 comprise a pair of sensors 20a and 20b, in particular a first proximity sensor 20a and a second proximity sensor 20b, each

adapted to generate a relative proximity signal when the relative distance between the magnetic element 18 and, respectively, the first proximity sensor 20a or the second proximity sensor 20b is less than a predetermined distance of measure, that is, when the magnetic element 18 is in, respectively, said first or second position, and to transmit said proximity signal to the electronic control unit 22.

[0036] As the first or second position of the magnetic element 18 corresponds respectively to the open or closed configuration of the working head 16, the electronic control unit 22 may therefore determine whether the working head 16 is in the open or closed configuration according to how many and which proximity signals it receives, and control the generation of the driving torque by the electric motor 12, and therefore the movement of the working head 16 between the open configuration and the closed configuration and vice versa as a function of said proximity signal.

[0037] In particular, the electronic control unit 22 may also be configured to ignore a possible erroneous signal, as in the case in which two proximity signals indicating conflicting information are received.

[0038] To allow an operator to activate the tool 10, the tool 10 is also provided with a pair of control buttons 38, adapted to transmit a command signal to the electronic control unit 22. The pair of control buttons 38 is arranged and constructed in such a way that an operator must use both hands to activate the control buttons 38 simultaneously. For example, it is possible to arrange the pair of control buttons 38 at a distance from each other greater than that which may commonly be reached with a single hand. Or it is also possible to make the pair of control buttons 38 so as to require a pressure force generally not obtainable with one hand, and as such, for example, to require the use of both thumbs of an operator's hands. In the preferable embodiment of the invention, the pair of buttons 38 is arranged on two opposite sides of the frame 24, so as to require an operator to use both hands to activate the pair of buttons 38 simultaneously, as shown in Fig. 2.

[0039] In a further embodiment, the tool 10 further comprises a luminous indicator, adapted to signal information to the operator; for example, a light indicator may be adapted to signal visually the outcome of the clamping operation of the hose clamps, or also to signal a charging condition of the battery 14 of the tool 10. In a preferred embodiment, the light indicator has two different indicator lights, in particular a first indicator light, for example a red light, adapted to light up in the event that the clamping operation of the hose clamps has not been completed correctly, and a second indicator light, for example a green light, adapted to light up if the clamping operation of the hose clamps has been completed correctly.

[0040] In a further embodiment, the light indicator is replaced or accompanied by an audible indicator adapted to signal information to the operator by means of sounds.

[0041] With reference now also to Fig. 4, a mounting

system 40 according to a further aspect of the invention comprises the tool 10 for mounting hose clamps, a command control box 42, and, preferably, also a data management system 44.

[0042] The mounting system 40 is made in such a way as to allow data communication between the tool 10 and the command control box 42, preferably by means of wireless transceiver means 46, such as for example a Bluetooth or infrared or radio wave transmission system, and the command control box 42 is arranged to allow an operator to display information relating to the operation of the tool 10, such as the number of correctly mounted hose clamps, the charge level of the battery 14 of the tool 10, the torque generated by the electric motor 12, or a malfunction indicator for the tool 10 or one of the components thereof.

[0043] For this purpose, the control box 42 is equipped with a display screen 48, and a keypad 50 for controlling the parameters of the display screen 48, as well as for entering parameters, data, programs, commands or instructions to be transmitted to the tool 10. In a preferable embodiment, the command control box 42 is equipped with a touch screen adapted to perform both the functions of the display screen 48 and the functions of the keypad 50, in a manner known per se.

[0044] In a preferred embodiment of the mounting system 40 according to the invention, the same command control box 42 is arranged to communicate with a plurality of tools 10, as well as to interface with the data management system 44, for example a data management system in a company server or in the cloud, for example by means of wireless transceiving means 46, such as for example a Bluetooth or infrared or radio wave transmission system, or, preferably, by means of wired data transmission. In this way, the command control box 42 allows the data stored in each tool 10 to be transmitted to the same data management system 44 and analyzed jointly.

[0045] The operation of the tool 10 according to the invention and of the related mounting system 40 is as follows.

[0046] The operator initially checks the available program options and sets a predefined clamping program via the command control box 42 and, possibly, customizes the parameters of the selected clamping program. The clamping program may be selected from a plurality of predefined programs, stored or defined by the user each time, or, again, self-defined by the command control box 42 through a self-learning function, for example through so-called deep learning algorithms, following a series of preliminary trial, training or testing operating cycles. The clamping programs may include various parameters, such as the number of hose clamps to be mounted, the size thereof, as well as a plurality of physical control parameters to be checked during the execution of the clamping program or at the end thereof, such as for example the time interval wherein the electric motor 12 delivers driving torque or the evolution over time of the torque delivered by the electric motor 12, or an inter-

nal temperature of the tool 10 not to be exceeded. In particular, the electronic control unit 22 may store a torque-stroke characteristic of the electric motor 12 by means of a self-learning procedure, in which, before the operative use of the tool 10, the tool 10 is used to perform a series of preliminary trial, training or test operating cycles, by means of which the electronic control unit 22 may extrapolate a torque-stroke characteristic of the electric motor 12 and store it. Finally, a clamping program may comprise clamping a single clamp or even a plurality of hose clamps.

[0047] Thus, the operator positions a hose clamp to be mounted so that it is supported by the working head 16 in order that it may be clamped on a tube. In this phase, the working head 16 is in the open configuration, so as to be able to accommodate the hose clamp.

[0048] The electronic control unit 22 is configured to control the generation of the driving torque by the electric motor 12 according to a control logic comprising the following steps:

- when only one of the buttons of the pair of control buttons 38 is activated, the electronic control unit 22 commands a first driving torque to be generated by the electric motor 12;
- when both buttons of the pair of control buttons 38 are activated, the electronic control unit 22 commands a second driving torque to be generated by the electric motor 12, wherein the second driving torque is greater than the first driving torque.

[0049] In this way, when the operator starts a clamping cycle by activating, i.e., pressing, one of the control buttons 38, the working head 16 begins to move from the open configuration to the closed configuration with a minimum force, avoiding risks or dangers for the operator. Then, when the operator activates or presses the other of the two control buttons 38 with the other hand, the electronic control unit 22 commands the actual clamping cycle to start; this clamping cycle is completed only if both control buttons 38 are kept activated or pressed.

[0050] At this point, the electronic control unit 22 commands the start of the clamping cycle, first by commanding the electric motor 12 to activate and, therefore, a driving torque to be generated, and by regulating the driving torque generated by controlling the relative critical parameters, such as, for example, the stroke, the current used by the electric motor 12, and, possibly, detecting the driving torque by means of strain gauges applied on the transmission means 32, for example on a transmission shaft. The electric motor 12, therefore, begins to deliver the driving torque that is first multiplied by the reduction mechanism and then transmitted, through the transmission means 32 to the working head 16, and in particular, converted by the worm screw 34 into an axial motion and transmitted through the thrust element 36 to the clamping elements 26.

[0051] During this movement, wherein the working

head 16 passes from the open configuration to the closed configuration, thus clamping the hose clamp, the magnetic element 18 moves integrally with the transmission means 32 from the first position to the second position (or, in an alternative embodiment not described in detail, the sensing means 20 move integrally with the transmission means 32). When it reaches the second position, that is, when the working head 16 has reached the closed configuration, and, therefore, the clamping process of the hose clamp is complete, the proximity sensing means 20 detect the proximity of the magnetic element 18, in particular the second proximity sensor 20b detects that the magnetic element 18 has reached the second position and generates a proximity signal which is transmitted to the electronic control unit 22. Upon receiving this proximity signal, the electronic control unit 22 sends an end-of-cycle signal, i.e., it commands the inversion of the driving torque generated by the electric motor 12 and transmitted to the working head 16. Upon receiving an inverse driving torque, the working head 16 begins the movement to return from the closed configuration to the open configuration. When this movement is complete, the magnetic element 18, which continues to move integrally with the transmission means 32, returns to the first position, and is detected by the first proximity sensor 20a, which sends a respective proximity signal to the electronic control unit 22 signaling that the magnetic element 18 has reached the first position, that is, returned to the initial position, and thus it is possible to start a new mounting and clamping cycle.

[0052] The electronic control unit 22 may also be configured to check the correct operation of the tool 10 and to provide, at the end of the clamping cycle, the operator with a signal or information indicating the success or failure of the clamping operation, and indirectly of the mounting.

[0053] In particular, the electronic control unit 22 may, for example, increase a counter for each hose clamp mounted, and, therefore, for each clamping cycle carried out and successfully completed, and automatically command the generation of driving torque by the electric motor 12 to be interrupted upon reaching a pre-set or predefined or user-defined number of mounted hose clamps.

[0054] The electronic control unit 22 may also be programmed to lock the tool 10 in a safe condition for the operator at the end of the clamping cycle or of the plurality of mounting cycles provided in the defined clamping program.

[0055] Furthermore, the control unit 22 may be configured to verify the correct execution of a predefined clamping program comprising the clamping of one or more hose clamps by determining the number of correctly mounted hose clamps based on at least one of the following parameters: the presence of a proximity signal generated by the proximity sensing means 20 and the number of said proximity signals generated by the proximity sensing means 20.

[0056] Lastly, the control unit 22 may be configured to

verify the correct execution of a predefined clamping program comprising clamping one or more hose clamps by means of a comparison of a target parameter of the predefined clamping program and at least one measured parameter representative of at least one among: the presence of at least one proximity signal generated by the proximity sensing means 20, the number of said proximity signals generated by the proximity sensing means 20, a stored torque-stroke characteristic of the electric motor 12, the instantaneous driving torque generated by the electric motor 12, the evolution of the driving torque generated by the electric motor 12 within a predefined time interval, a time interval comprised between the reception of two consecutive proximity signals generated by the proximity sensing means 20, and a total time period of generation of the driving torque of the electric motor 12.

[0057] The result of verifying the correct execution of the predefined clamping program may be communicated to the operator by means of the light indicator, for example by means of a first indicator light, for example a red light, adapted to light up if the verification has given a negative result, and a second indicator light, for example a green light, adapted to light up if the verification has a positive result.

[0058] As is evident from the description provided above, a tool according to this invention provides several advantages.

[0059] First of all, due to the use of proximity sensing means and a magnetic element to determine the position of the transmission means and, therefore, the configuration of the working head, the tool according to this invention is more precise and therefore more reliable than known tools for mounting hose clamps.

[0060] Moreover, by using the electric power supply instead of the commonly used pneumatic one, it will be possible to avoid the accidental diffusion in the working environment of lubricated compressed air. Furthermore, in the preferable embodiment wherein the tool comprises an electric motor and a battery, the tool does not need to be powered by an electric power cable or by a pneumatic power tube, ensuring the operator greater freedom of movement and therefore making the mounting and clamping of the hose clamps safer and easier.

[0061] Due to the possibility of disassembling the working head from the tool frame, it is possible to remove or replace the working head, thus permitting the same tool to be used for mounting hose clamps of a different type or size and allowing the operator to choose the working head best adapted to the specific hose clamp.

[0062] The use of a pair of control buttons that may be activated only by using both hands adds an additional level of safety to the tool, avoiding accidental activation of the tool and making it impossible for an operator's hand to be too close to the working head as it moves from the open configuration to the closed configuration.

[0063] Lastly, the use of a tool according to the invention together with a command control box and, preferably,

a data management system, allows for the operating parameters of one or more tools to be controlled remotely, as well as, by analyzing the data obtained from each clamping cycle, for any errors by the operator or the predefined clamping program to be identified.

[0064] Naturally, without prejudice to the principle of the invention, the embodiments and the details of construction may be widely varied with respect to that which has been described and illustrated purely by way of non-limiting example, without thereby departing from the scope of the invention defined in the appended claims.

Claims

1. A tool (10) for mounting hose clamps on a tube, comprising:

an electric motor (12) adapted to generate a driving torque;

a working head (16), removably mounted on the tool (10), and adapted to move between an open configuration, wherein it is adapted to accommodate a hose clamp, and a closed configuration, wherein it is adapted to clamp said hose clamp on the tube;

transmission means (32), interposed between said electric motor (12) and said working head (16), adapted to transmit said driving torque generated by the electric motor (12) to said working head (16) to drive the movement of the working head (16) between the open configuration and the closed configuration;

a magnetic element (18) and proximity sensing means (20), the proximity sensing means (20) being adapted to generate a proximity signal when the relative distance between the magnetic element (18) and the proximity sensing means (20) is less than a predetermined distance of measure;

an electronic control unit (22) configured to control the driving torque generated by the electric motor (12) depending on said proximity signal generated by the proximity sensing means (20); the tool (10) further comprising a pair of control buttons (38) designed to transmit a command signal to the electronic control unit (22); wherein the pair of control buttons (38) is arranged and made in such a way that an operator must use both hands to activate them simultaneously; and

wherein the electronic control unit (22) is configured to control the generation of the drive torque by the electric motor (12) according to a control logic comprising the following steps:

when only one of the buttons of the pair of control buttons (38) is activated, the elec-

tronic control unit (22) commands a first driving torque to be generated by the electric motor (12);

when both buttons of the pair of control buttons (38) are activated, the electronic control unit (22) commands a second driving torque to be generated by the electric motor (12), wherein the second driving torque is greater of the first drive torque.

2. The tool according to claim 1, further comprising at least one battery (14) adapted to supply electric power to the electric motor (12).

3. The tool according to claim 1 or claim 2, **characterized in that** the magnetic element (18) is arranged integral with the transmission means (32) and is adapted to be drawn by said transmission means (32) between a first position, wherein the working head (16) is in the open configuration, and a second position, wherein the working head (16) is in the closed configuration.

4. The tool according to any of the preceding claims, wherein the transmission means (32) comprise a worm screw (34) adapted to convert a rotary motion generated by the electric motor (12) into an axial motion transmitted to the working head (16).

5. The tool according to any of the preceding claims, wherein the proximity sensing means (20) comprise a pair of sensors (20a, 20b), in particular a first proximity sensor (20a) and a second proximity sensor (20b), each adapted to generate a respective proximity signal when the relative distance between the magnetic element (18) and, respectively, the first proximity sensor (20a) or the second proximity sensor (20b), is lesser than a predetermined distance of measure.

6. Tool according to any of the preceding claims, wherein the control unit (22) is configured to control the inversion of the direction of rotation of the electric motor (12) and, thus, of the motion transmitted to the working head (16) when a proximity signal generated by said proximity sensing means (20) is received by the control unit (22).

7. Tool according to any of the preceding claims, wherein the pair of control buttons (38) are arranged on opposite sides of the tool (10).

8. The tool according to any of the preceding claims, wherein the electronic control unit (22) is further configured to verify the correct execution of a predefined clamping program comprising clamping one or more hose clamps, and wherein the tool (10) further comprises a luminous indicator and/or a sound indicator

adapted to signal the outcome of the verification of the electronic control unit (22).

9. The tool according to claim 8, wherein the electronic control unit (22) is further configured to verify the correct execution of a predefined clamping program comprising clamping one or more hose clamps by determining the number of correctly mounted hose clamps based on at least one of: the presence of a proximity signal generated by the proximity sensor means (20) and the number of said proximity signals generated by the proximity sensor means (20). 5
10. The tool according to claim 8 or claim 9, wherein the electronic control unit (22) is further configured to verify the correct execution of a predefined clamping program comprising clamping one or more hose clamps, by comparing a measured torque-stroke characteristic of the electric motor (12) and a stored torque-stroke characteristic of the electric motor (12). 10 15 20
11. The tool according to any claim from 8 to 10, wherein the electronic control unit (22) is further configured to verify the correct execution of a predefined clamping program comprising clamping one or more hose clamps, by means of a comparison of a target parameter of the predefined program of which the electronic control unit (22) is verifying the correct execution and at least one measured or detected parameter representative of at least one among: the presence of at least one proximity signal generated by the proximity sensing means (20), the number of said proximity signals generated by the proximity sensing means (20), the instantaneous driving torque generated by the electric motor (12), the evolution of the driving torque generated by the electric motor (12) within a predefined time interval, a time interval comprised between the reception of two consecutive proximity signals generated by the proximity sensing means (20), and a total time period of generation of the driving torque of the electric motor (12). 25 30 35 40
12. A mounting system (40) comprising a tool (10) according to any of the preceding claims and a command control box (42), wherein the tool (10) further comprises wireless transceiving means (46) for receiving and transmitting data between the tool and the command control box (42), wherein the command control box (42) is arranged to allow an operator to see information relating to the operation of the tool (10), the information being at least one among: the number of hose clamps correctly clamped, the level of charge of the battery (14) of the tool (10), the torque generated by the electric motor (12), and a malfunction indicator of the tool (10). 45 50 55

13. The mounting system according to claim 12, further comprising a data management system (44), and wherein the command control box (42) is arranged to communicate with a plurality of tools (10) according to any of the claims from 1 to 11, and wherein the command control box (42) is further arranged to interface with the data management system (44), the data management system (44) being adapted to receive, store, and process data originating from at least one of the tools (10) of said plurality of tools (10).

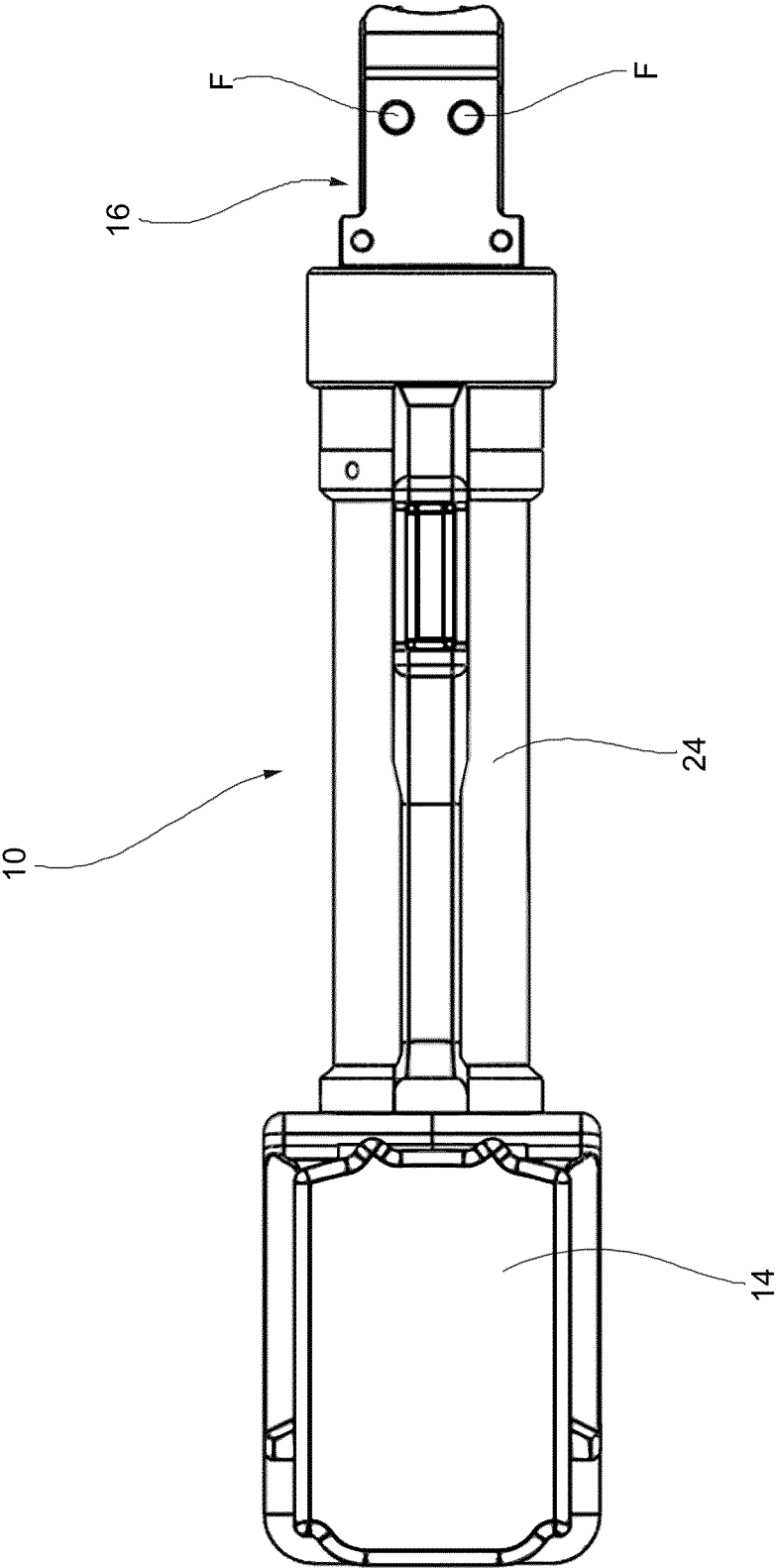


FIG. 1

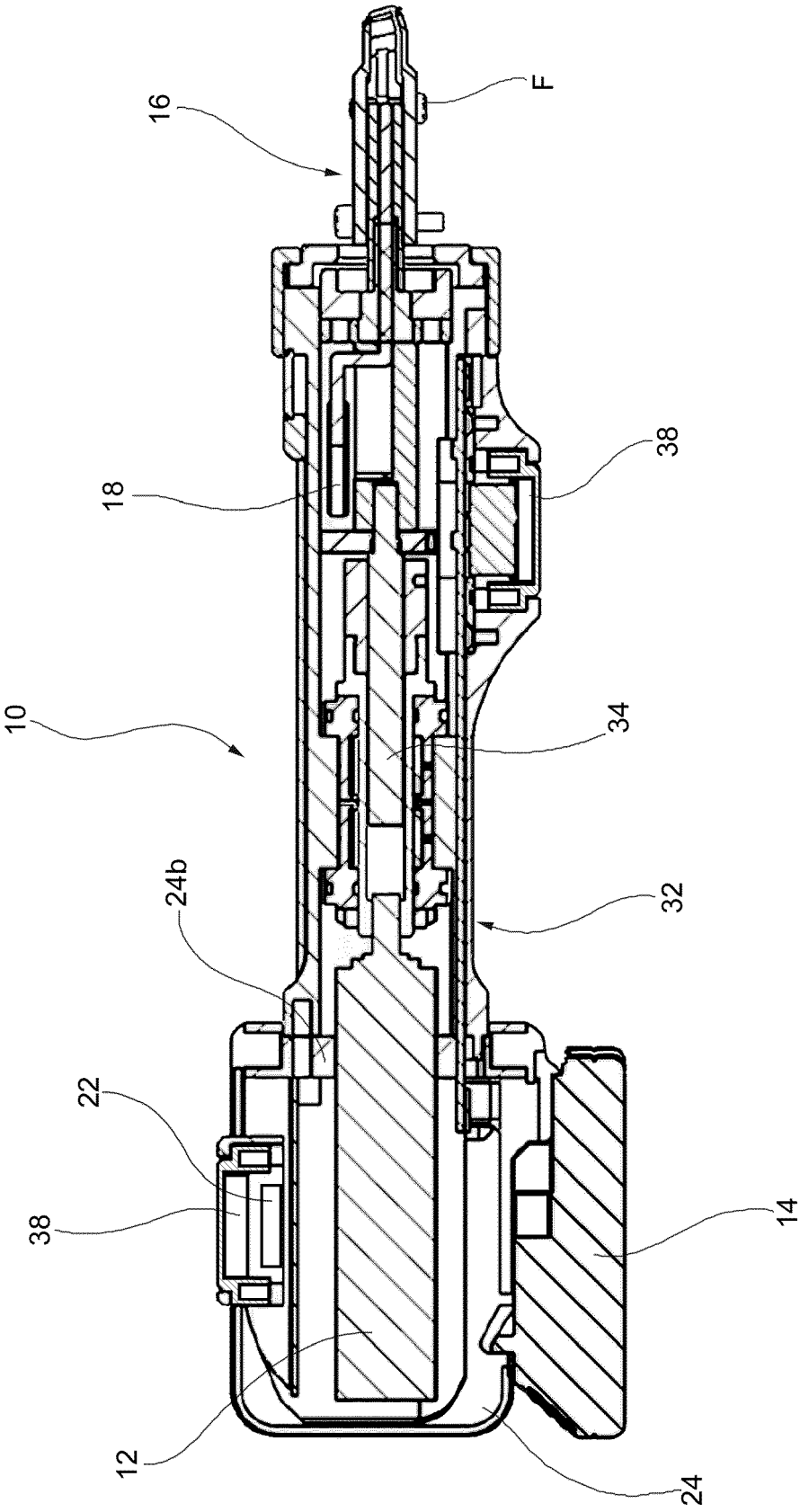


FIG. 2

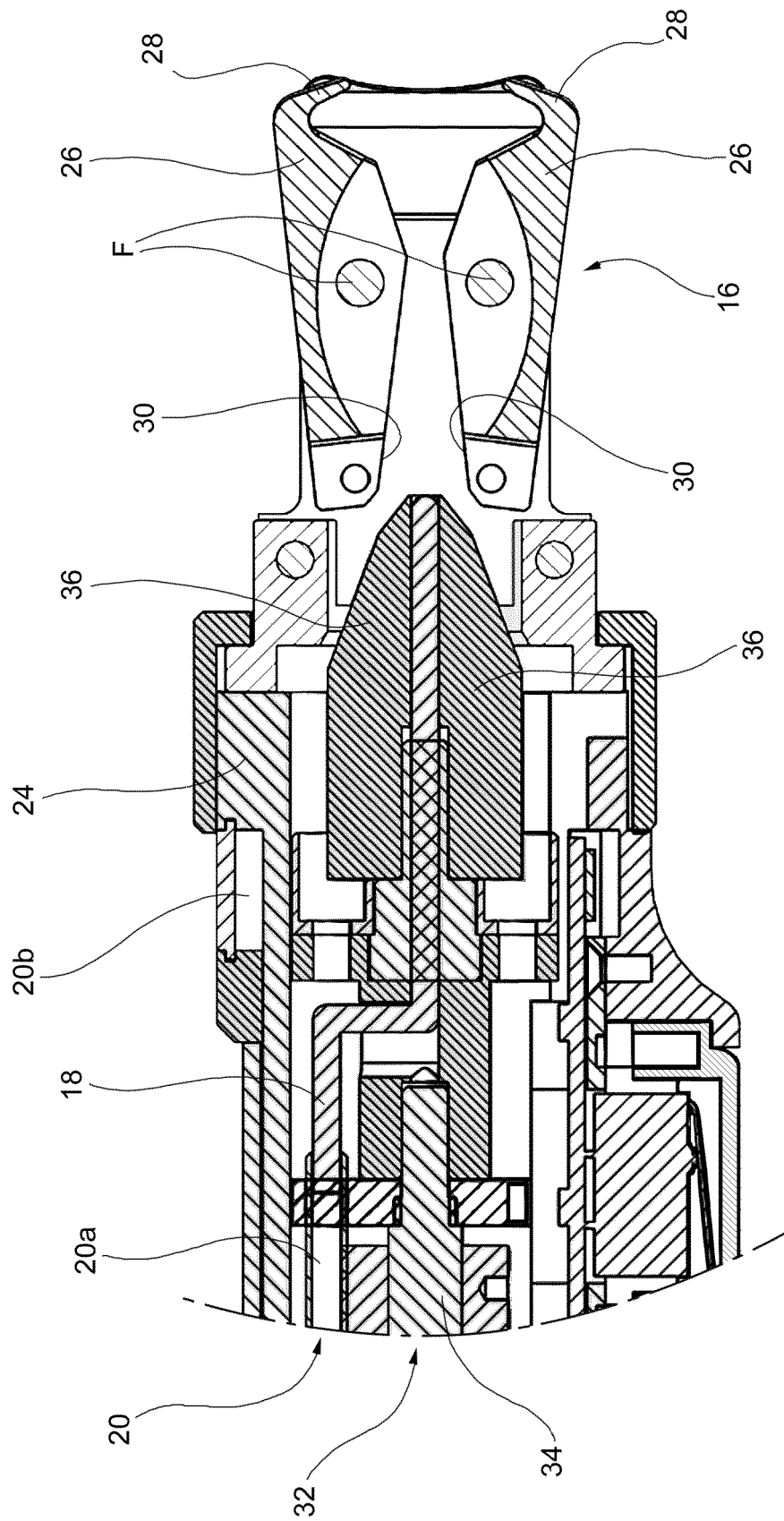


FIG. 3a

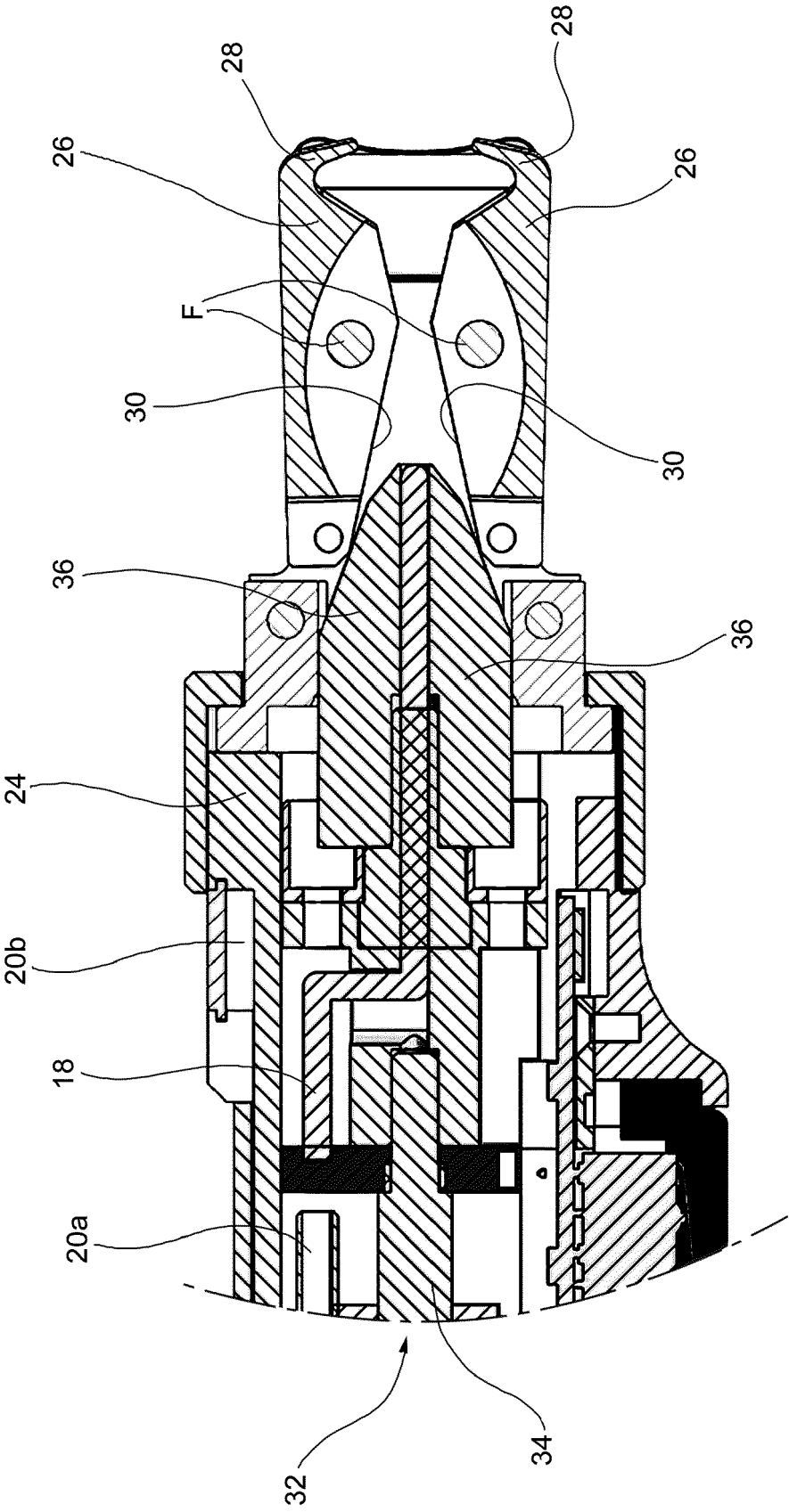


FIG. 3b

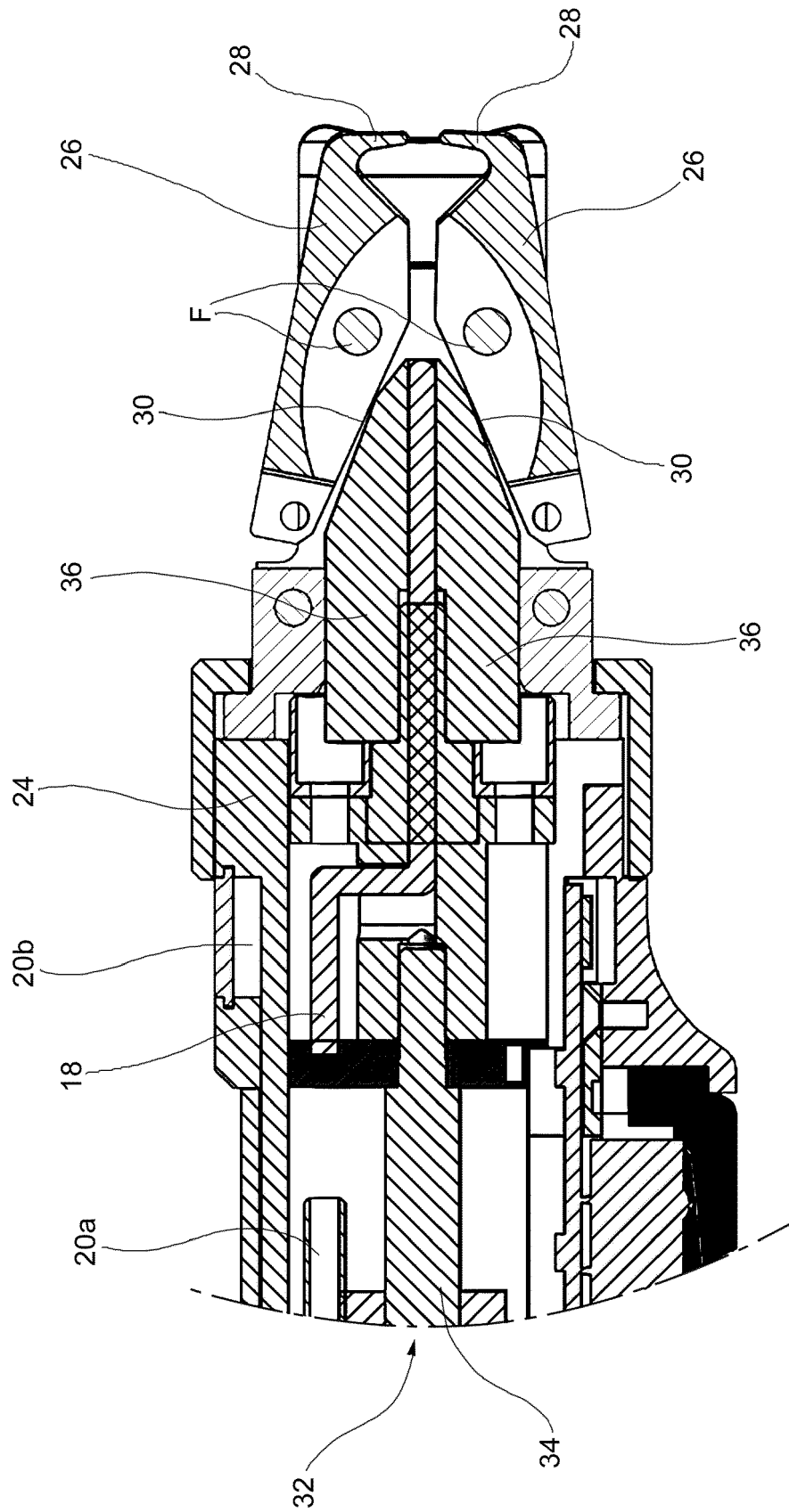
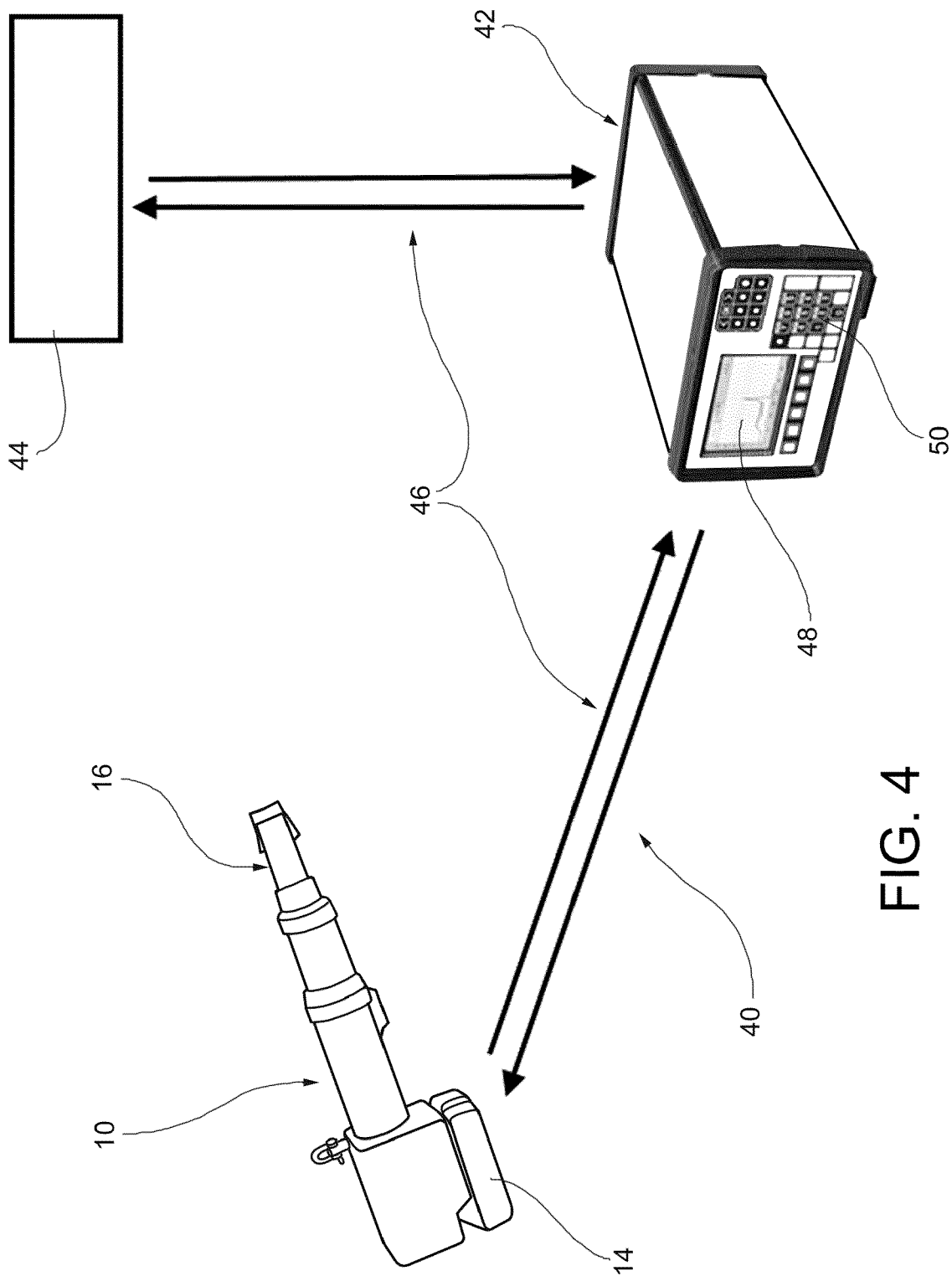


FIG. 3C





EUROPEAN SEARCH REPORT

Application Number
EP 21 15 4889

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A	EP 3 075 492 A1 (MILWAUKEE ELECTRIC TOOL CORP [US]) 5 October 2016 (2016-10-05) * paragraph [0032] - paragraph [0052]; figures 1-11 *	1-13	
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			B25B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 16 June 2021	Examiner Pothmann, Johannes
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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