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(54) **Vibrating device for concrete compacting**

(57) Vibrating device (1) for concrete compacting of the type that comprise a vibrating head (2), a control unit (3), and a frequency shifting unit (4), which converts single phase current into three phase current, as well as a plug (5) to be plugged into the electrical network. The frequency shifting unit (4) and the control unit (3) are

arranged independently from each other and united together by a long multiple-pole electrical cable (12), with the frequency shifting unit being located in a relatively close position to the plug (5), and the control unit (3) being located between the mentioned long multiple-pole electrical cable (12) and the beginning of the immersion area (23).

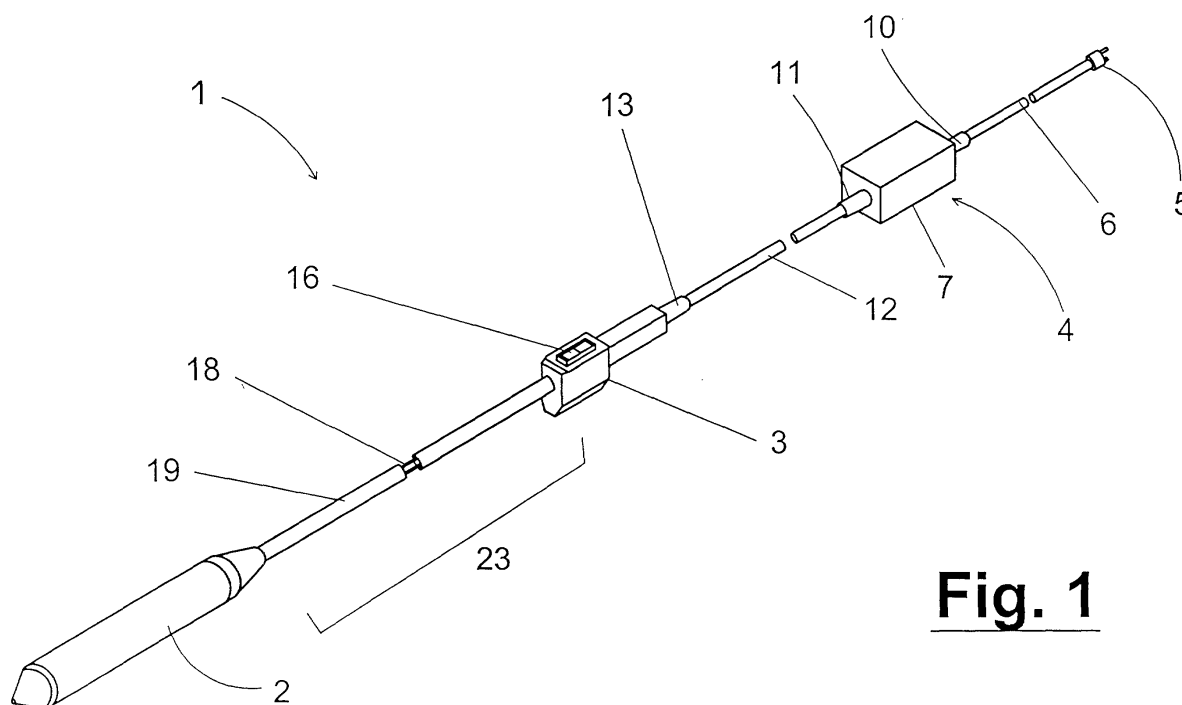


Fig. 1

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Description

Technical field of the invention

[0001] The invention refers to a vibrating device for concrete compacting of the type which have an electrical motor operated by a switch and powered by a converter, and specifically the type in which the converter is combined with the switch to form a miniaturized unit.

Background of the invention

[0002] Until a few years ago, the single phase to three phase converters used in the construction field were used as devices separate from the vibrators for concrete compacting. What was done was to connect a converter directly to the power at the site, and then each one of the vibrators was connected to the converter individually, with the consequent inconveniences this entailed, such as: having to use the same frequency for all of the vibrators connected to the same converter; in the event of a fault with the converter, all of the vibrators connected to it were affected and became inoperative.

[0003] Later on, with the purpose of solving the problems described above, new types of vibrators have appeared which incorporate a miniaturized control unit located in an area of easy access for the user of the device. Located on said control unit are the converter and the motor activation switch, so the operator must carry said control unit in order to activate and stop the vibrator at his convenience. With this device some of the described existing problems in the use of vibrating devices for concrete compacting were reduced, and others were eliminated, but at the same time new problems have appeared, which will be mentioned later on, that have derived from this more recent technology. In any case, and despite these problems, these devices are widely used at present.

[0004] Patent document EP-A-0604723 describes an internal vibrator for concrete compacting, with an electrical motor powered by a converter and with a switch for its connection and disconnection. The converter and switch are adapted to form a miniaturized control unit located in an area relatively near to the vibrating rig.

[0005] The main problems that the operators encounter nowadays while using vibrating devices for concrete compacting of the type described in EP-A-0604723 are, on one hand the difficulty to operate the device that the operator who is holding it with one hand encounters when he is in a difficult balance position, which happens often at construction sites, requiring the use of the other hand to hold on and not fall down, with the corresponding risk that this entails for the operator's safety.

[0006] Another inconvenience presented by the vibrating devices of the type described in patent EP-A-0604723 is their elevated weight, since each control unit has a weight comprised between 3 and 4 kg, which must always be supported by the operator using the vibrator,

both when it is in operation as well as when he is moving it. Also, the vibrating device, and especially the frequency shifter that is near the vibrating head, is permanently submitted to harsh treatment which usually involves that said element suffers knocks and other violent effects, with the consequent risk of breaking; another inconvenience presented by the previously described vibrating devices is the difficulty to handle them due to their elevated weight and substantial size as was explained before, factors that have a great importance during the maneuvers of introducing and extracting the vibrator from the casing, since in addition to the difficulty that the operator has to find an adequate work position there is the weight and volume of the control unit, which greatly hinders the execution of the work.

Explanation of the invention

[0007] With the object of providing a solution to the previously described problems, which derive from a lack of functionality caused by the elevated weight and volume of the control units of the vibrators for concrete compacting known up until now, a vibrating device for concrete compacting has been created with a new structure and functionality.

[0008] The vibrating device for concrete compacting object of the present invention comprises a frequency shifter unit, which converts single phase power into three phase power, a control unit with a switch to turn on the device and stop it, and a vibrating head, as well as a plug in order to be plugged into an electrical socket, a flexible and isolated electrical cord, for connection to the electrical network, which links said plug with the frequency shifter unit, and an immersion area right next to the vibrating head, consisting of isolated electrical conductors having a flexible, tubular protective covering, usually made of a tube of rubber or an equivalent material.

[0009] The vibrating device for concrete compacting according to the invention is characterized in that the frequency shifting unit and the control unit are arranged independent from each other and connected by a long multiple-pole electrical cable, with the frequency shifting unit being located in a relatively close position to the plug, and the control unit being located between the mentioned long multiple-pole electrical cable and the beginning of the immersion area.

[0010] According to another characteristic of the vibrating device according to the invention, the frequency shifter unit is capable of generating variable frequencies, adjustable at will, in order to suit the mass of concrete that is desired to be vibrated.

[0011] According to another characteristic of the invention, the switch of the control unit can be activated and deactivated exclusively by direct manual activating means.

[0012] According to an alternative characteristic of the vibrating device object of the present invention, the con-

trol unit has radio frequency and/or infrared sensor elements adapted to act upon the switch intended for starting or stopping the motor located in the vibrating head, commanded by means of a remote control unit.

[0013] According to another alternative characteristic of the invention, the control unit has, aside from the remote control, means of direct manual activation.

[0014] The above described characteristics of the vibrating device for concrete compacting object of the present invention provide solutions to the problems previously described of the present art. In effect, with regards to the weight, the control unit only weighs between 0.400 and 0.800 kg, since the frequency shifting unit, which is independent, is supported on a surface, usually the floor. With regards to the improvements for the handling by the operator, this is a logical consequence derived from the mentioned reduction of weight. With respect to the harsh treatment, there is no doubt that there is a very significant reduction of the knocks and other possible harmful treatments suffered by the frequency shifting unit since it is not permanently united to the user's handling, but to the contrary it is supported on a surface away from the operating area; a positive consequence is that a greater operating time without damages to the vibrating device is attained.

Brief description of the drawings

[0015] In the pages of drawings of the present description there is a representation of an internal vibrating device for concrete compacting object of the invention. In said drawings:

Figure 1 is a general and perspective view of the vibrating device of the invention;

Figure 2 is a partial and selectively sectional view of the vibrating device object of the invention;

Figures 3, 4 and 5 are sectional views of the control unit which respectively represent three different forms of embodiment.

Figure 6 is another partial and selectively sectional view.

Detailed description of the drawings

[0016] The following description refers to the previously described drawings, which allow to appreciate in detail the elements which constitute the vibrating device for compacting concrete according to the invention, and more specifically of the vibrators for concrete compacting which are described as an example of embodiment.

[0017] As can be seen in Figure 1, in the vibrating device 1 for concrete compacting object of the invention three main elements can be distinguished, a vibrating head 2, a control unit 3, and a frequency shifting unit 4.

[0018] On one of the ends of the vibrating device 1 the plug 5 is positioned which is adapted for being connected to an electrical socket of a 220-240 V/50 Hz net-

work in the case of Europe, and 115 V/60 Hz in the case of the United States of America, in either of the two cases, single phase alternating current networks.

[0019] The plug 5 and the frequency shifting unit 4 are united to each other by a relatively reduced length, of approximately 2 meters, of flexible and isolated electrical cable 6, for connection to the electrical network, which comprises two active conductors and one for protection.

[0020] In Figure 2, which represents the device partially and in more detail, it can be seen that the frequency shifting unit 4 comprises a box 7 of rectangular parallelepiped shape in the interior of which is housed an electronic frequency shifter 8 and a safety device, mainly consisting of a fuse box 9 adapted to prevent short circuits and to prevent grounding discharges.

[0021] The electronic frequency shifter 8 is capable of generating variable frequencies at will between approximately 150 and 300 Hz in order to adapt to a greater or smaller mass of concrete that is desired to be vibrated.

[0022] The electronic shifters of the previously mentioned type capable of generating variable frequencies are well known in the state of the art, for which it is not necessary to go into detail about its structure nor its operation. And, therefore, neither has it been represented in detail in the drawings.

[0023] Two of the opposing ends of the box 7 of the frequency shifter unit 4 possess matching stuffing boxes 10, 11 which extend longitudinally toward the exterior of the box 7 to isolate the electronic circuits of the frequency shifter 8 and the fuse box 9 from external agents which could deteriorate said circuits.

[0024] The frequency shifting unit 4 and the control unit 3 are united by means of a minimum of approximately 10 meters, and preferably of 15 meters, of multiple-pole electrical cable 12 of five active conductors and one of protection, flexible and isolated, to ensure the adequate operation of the vibrating device.

[0025] The connection of the control unit 3 with the multiple-pole electrical cable 12 is protected and secured with a stuffing box 13 to isolate the interior of said control unit 3 from aggressive external agents.

[0026] Inside the control unit 3 a main electrical switch 14 is positioned to start or stop the motor 15 located in the vibrating head 2.

[0027] Figures 3, 4 and 5 each represent a different form of embodiment in what concerns the way of starting or stopping the vibrating device 1.

[0028] According to the embodiment represented in Figure 3 the main switch 14 located inside the control unit 13 is activated manually by means of the button 16 for manual operation. In other words, the operator who is using the vibrating device 1 according to the invention cares for starting and stopping it acting directly upon the button 16.

[0029] According to the alternative embodiment seen in Figure 4, the main switch 14 is linked to an electronic sensor element 17 for connection and disconnection,

capable of receiving a signal of radio frequency, infrared ray, ultrasound, or any other adequate known system, which is emitted from a remote control unit 24, in order that it can activate or stop the motor 15 located in the vibrating head 2 from a certain distance. Therefore, it is not necessary that the operator who is using the vibrating device 1 be the same person who starts it and/or stops it.

[0030] In Figure 5 another alternative has been drawn consisting in combining the two possibilities explained in Figures 3 and 4. In other words, it consists of that the control unit 3 is equipped with a manual activation button 16 and also an electronic sensor element 17 for connection and disconnection which is sensitive to the signals emitted from a remote control unit 24, in a similar manner to what has been explained above when describing Figure 4. Both the manual activation button 16 as well as the electronic sensor element 17 act upon the main electric switch 14. This embodiment of Figure 5 is the most complete and it allows to enjoy the advantages of the two types of activation: the direct manual activation, and the activation from a distance with the assistance of a remote control unit 24.

[0031] Figure 6 represents in detail the vibrating head 2. The control unit 3 and the vibrating head 2 are united by isolated electrical conductors 18 (3 active conductors and a protection conductor) of three phase alternating current.

[0032] The electrical conductors 18 are covered with a protective tubular covering 19 of flexible material, generally of rubber or an equivalent material, which can be submerged inside the mass of concrete.

[0033] The vibrating head 2 located at the end of the vibrating device 1 basically has an elongated cylindrical shape with a conical end, and it is art which is well known.

[0034] Housed in the main part of the inside of the vibrating head 2 is the electrical motor 15 of variable frequency between approximately 150 and 300 Hz.

[0035] Arranged at the end of the axis of the mentioned variable frequency motor are some balance weights 20, 21 and some bearings 22 which produce a vibration for each turn of the motor 15.

(19), **characterized in that** the frequency shifting unit (4) and the control unit (3) are arranged independently from each other and united together by a long multiple-pole electrical cable (12), with the frequency shifting unit being located in a relatively close position to the plug (5), and the control unit (3) being located between the mentioned long multiple-pole electrical cable (12) and the beginning of the immersion area (23).

2. Vibrating device for concrete compacting according to claim 1, **characterized in that** the frequency shifting unit (4) is adapted to generate variable frequencies, adjustable at will, in order to suit the mass of concrete that is desired to be vibrated.
3. Vibrating device for concrete compacting according to either of the claims 1 and 2, **characterized in that** the switch (14) of the control unit (3) can be activated or deactivated exclusively by means (16) of direct manual activation.
4. Vibrating device for concrete compacting according to either of the claims 1 and 2, **characterized in that** the control unit (3) possesses radio frequency and/or infrared ray sensor elements (17) adapted to act upon the switch (14) intended for starting or stopping the motor (15) located in the vibrating head (2), commanded by means of a remote control unit (24).
5. Vibrating device for concrete compacting according to either of the claims 1, 2 and 4, **characterized in that** the control unit (3) possesses, aside from the activation means of the switch (14) by means of the radio frequency and/or infrared ray sensors (17) and the remote control unit (24), means (16) of direct manual activation.

Claims

1. Vibrating device for concrete compacting of the type that comprise a vibrating head (2), a control unit (3), and a frequency shifting unit (4), which converts single phase current into three phase current, as well as a plug (5) to be plugged into an electrical socket, a flexible and isolated electrical cable (6) for connection to the electrical network, which links said plug (5) with the frequency shifting unit (4), and an immersion area (23) right next to the vibrating head (2) consisting of isolated electrical conductors (18), covered with a tubular, flexible protective covering

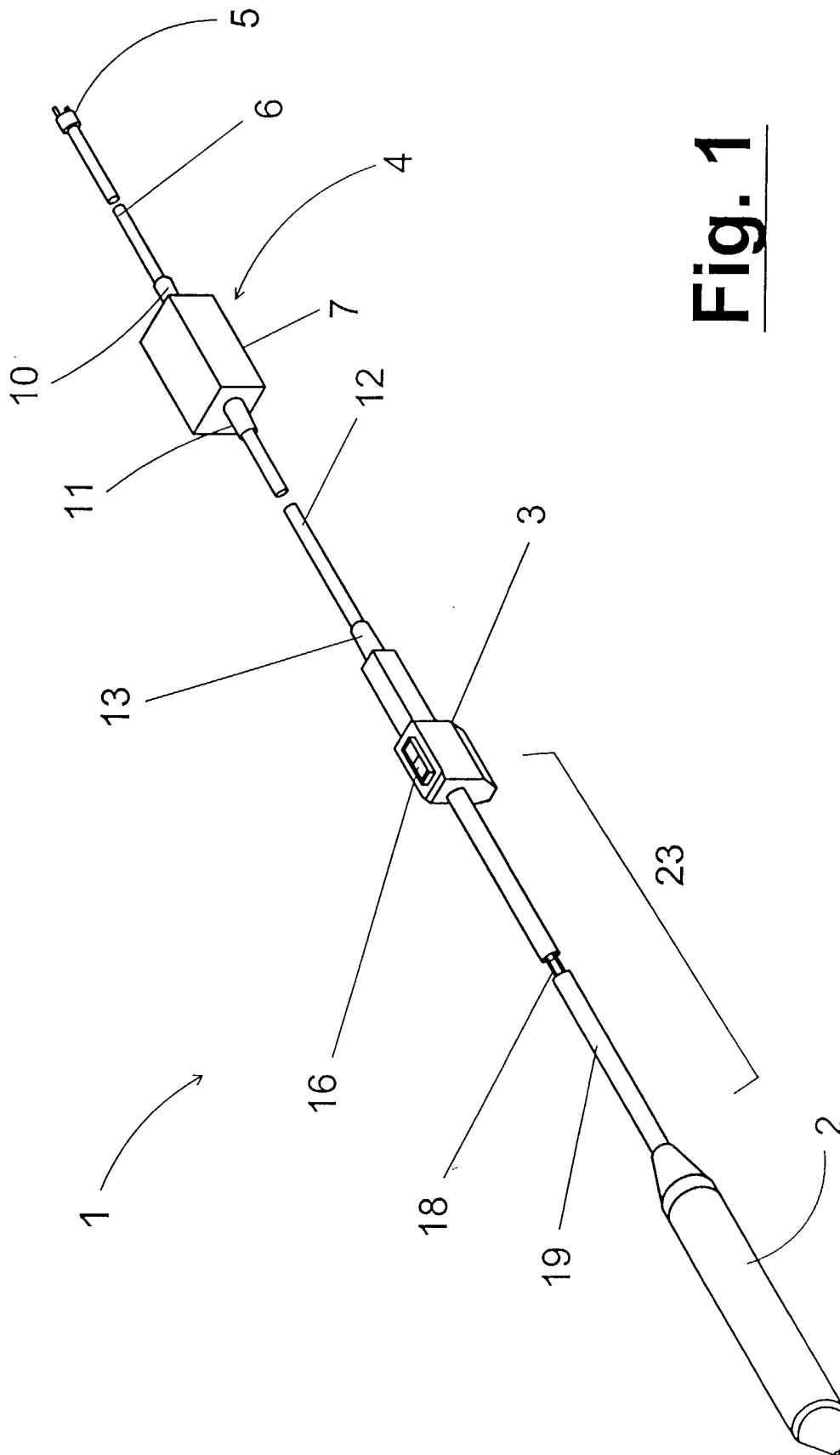
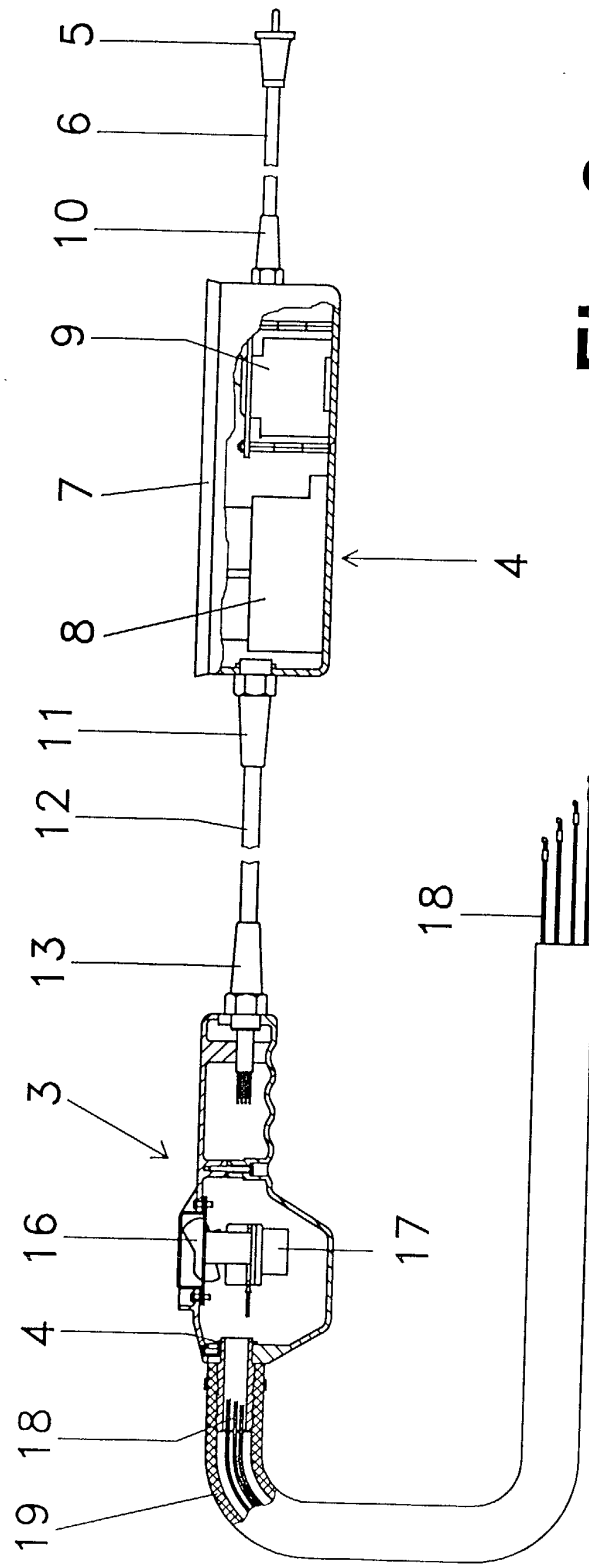


Fig. 1



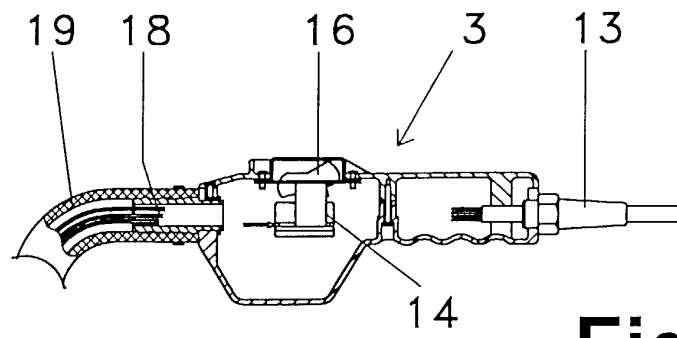


Fig. 3

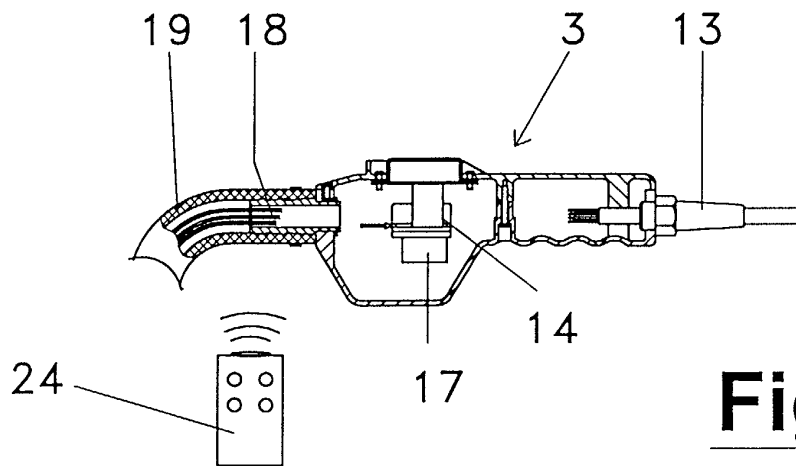


Fig. 4

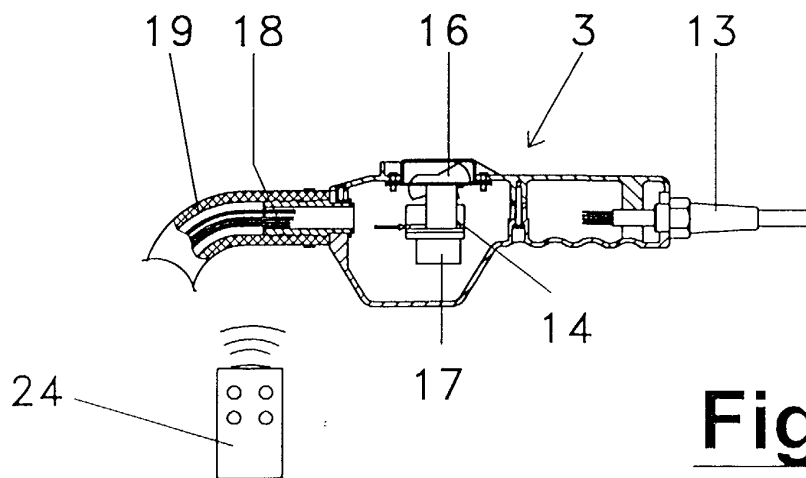


Fig. 5

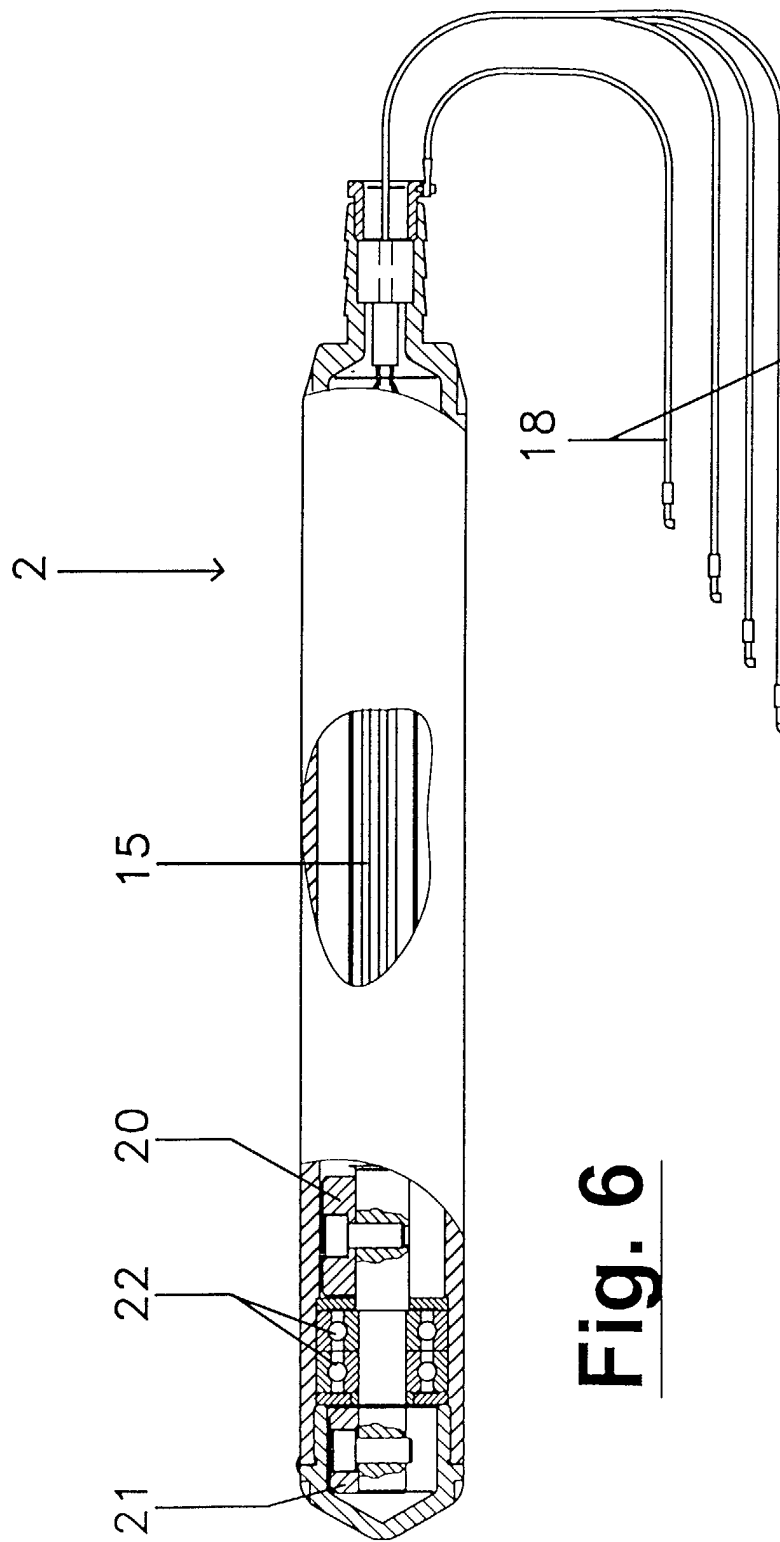


Fig. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 01 50 0278

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 6 May 2002	Examiner Andlauer, D
CATEGORY OF CITED DOCUMENTS X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document		T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons ----- &: member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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