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UKRAINE
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PATENT

for utility model

No. 156684

METAL DETECTOR

Issued in accordance with the Law of Ukraine "On Protection of Rights to Inventions and Utility Models".

Registered in the State Register of Ukraine for Utility Models on **24.07.2024**.

Director
of State Organization "Ukrainian
National Office of Intellectual Property
and Innovation"

/signature/

O.P. Orliuk

/SEAL/ UKRAINE * MINISTRY OF ECONOMY OF UKRAINE * STATE ORGANIZATION
"UKRAINIAN NATIONAL OFFICE OF INTELLECTUAL PROPERTY AND INNOVATION" *
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(21) Application number: **u 2024 00490**

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(22) Application filing date: **30.01.2024**

(24) Date from which intellectual property rights are effective: **25.07.2024**

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(46) Date of publication of information about state registration and Bulletin number: **24.07.2024, Bull. No. 30**

(54) Title of utility model:

METAL DETECTOR

(57) Formula of utility model:

Metal detector comprising a sensor connected with the possibility of rotation to a rod and connected to a signal processing unit, characterized in that the sensor is made in the form of a frame with jumpers, equipped with a connection point with a rod mounting mechanism, the rod is made telescopic of at least two parts and has a locking nut, the sensor is connected to the signal processing unit by wireless communication in the form of Bluetooth, in addition, a device for placing a control unit is fixed on the rod, and at the end of the rod opposite to the end with the sensor, there is a handle with an armrest, while the control unit has appropriate programs and applications that allow reading signals transmitted by the coil, the control unit has a power button and a screen on which the type of metal object is determined, there is a noise suppression and signal amplification indicator, depth indicator in percentages, charge level of the main unit and sensor, buttons for turning on the hodograph and sinograph.

NATIONAL INTELLECTUAL PROPERTY AUTHORITY
State Organization
"Ukrainian National Office of Intellectual Property and Innovation"
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I.Ye. Matusevych

24.07.2024

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"UKRAINIAN NATIONAL OFFICE OF INTELLECTUAL PROPERTY AND INNOVATION" *
Identification code 44673629 * UKRNOIPI*

(12) DESCRIPTION OF UTILITY MODEL PATENT

(21) Application number: **u 2024 00490**
(22) Application filing date: **30.01.2024**
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are effective: **25.07.2024**
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No. 30**

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IVCHENKO OLEH ANDRIIOVYCH

(54) METAL DETECTOR

(57) Abstract:

Metal detector comprising a sensor connected with the possibility of rotation to a rod and connected to a signal processing unit, characterized in that the sensor is made in the form of a frame with jumpers, equipped with a connection point with a rod mounting mechanism, the rod is made telescopic of at least two parts and has a locking nut, the sensor is connected to the signal processing unit by wireless communication in the form of Bluetooth, in addition, a device for placing a control unit is fixed on the rod, and at the end of the rod opposite to the end with the sensor, there is a handle with an armrest, while the control unit has appropriate programs and applications that allow reading signals transmitted by the coil, the control unit has a power button and a screen on which the type of metal object is determined, there is a noise suppression and signal amplification indicator, depth indicator in percentages, charge level of the main unit and sensor, buttons for turning on the hodograph and sinograph.



Fig. 1

The utility model relates to search equipment, particularly to the field of physics and geophysics, and is intended for searching and detecting metal objects on the ground surface, in soil (snow), water and underwater, under road surfaces, underwater in soil sediments, in archaeology, for treasure hunting, rescue operations, military demining tasks, by diving services, divers, scuba divers, and swimmers, for inspecting people to detect prohibited metal objects in clothing or on the human body, in the food industry for detecting metal objects in food products, in construction for detecting copper or aluminum conductors to avoid them when drilling or for extraction and restoration of conductor integrity, in road construction to detect metal objects under road surface to prevent damage to road machinery when metal gets into working tools, in medicine for searching bullets or fragments in the human body, in the laundry industry for controlling textile products for sharp metal objects left in them that could damage washing machine mechanisms, for ensuring safety at outdoor mass events, even under atmospheric precipitation conditions.

A metal detector is known, taken as the closest analog, containing a sensor hinged to a telescopic rod, a signal processing unit, and a shielded switching cable located in the rod cavity and connected by sealed connectors at one end to the sensor and at the other end to the electronic signal processing unit. The sensor is made in the form of a sealed dielectric frame equipped with a hinge connection plug and has a special groove around the perimeter in which structurally combined transmitting and receiving inductance coils are sealed and connected to the switching cable. The rod consists of five round sections with the ability to change and fix the working length of the rod within 350-1200 mm. The lower section of the rod is equipped with the corresponding part of the hinge connection plug, the upper section of the rod is equipped with a quick-release "dovetail" type connector. The electronic signal processing unit has a rectangular duralumin housing in which a chassis with electronic signal processing boards and a cassette with power supply elements are fixed. The housing is equipped with a hinged flip cover. On one of the narrow faces of the housing, there is a corresponding "dovetail" connector element for connection to the rod, and on the front panel of this unit there are a switching cable connection socket, an audio indicator socket, as well as volume control resistor adjustment knobs (RU No. 159147, published: 10.02.2016 Bull. No. 4).

The disadvantage of this metal detector is that it has a detachable construction in which the rod disconnects from the control unit, which requires manufacturing an additional mechanical assembly for reliable attachment of the metal detector parts and leads to complication of the manufacturing process, increased cost of the metal detector construction, and increased weight. Also, the attachment element of the control unit to the metal detector rod reduces the functional reliability of the device - for example, when the attachment assembly is damaged due to wear, abrasion, impact, thermal expansion and compression, the device completely loses functionality. Moreover, this metal detector does not have a holding handle and mechanical control for operator movement of the device, which greatly complicates the process of working with the device, because the operator has to hold the device directly by the rod at an inconvenient and unergonomic angle for the wrist, thereby reducing search time and causing harm to the operator's wrist joint and ligaments. The weight of the device and uneven distribution along the device length load only the operator's wrist at an inconvenient holding angle. This metal detector does not have an armrest that serves to redistribute the metal detector's weight from the wrist to the operator's elbow, which greatly reduces the operator's working time with the metal detector, decreases its length, and limits its use by tall operators. This metal detector has a sensor signal cable that connects to the control unit via a plug connector, which reduces the reliability of the metal detector's operation due to deterioration of the connector's electrical contact as a result of oxidation, wear, mechanical damage, and leads to complete device failure and loss of functionality.

The utility model is based on the task of creating an effective, compact, reliable device with improved characteristics for solving a wide range of search tasks with good ergonomic characteristics, with the ability to quickly select a rod length convenient for the operator and the presence of an armrest.

The stated problem is solved by the fact that in a metal detector containing a sensor connected with the possibility of rotation to a rod and linked to a signal processing unit, according to the utility model, the sensor is made in the form of a frame with crossbars, equipped with a connection point with a rod attachment mechanism, the rod is made telescopic from at least two parts and has a locking nut, the sensor is linked to the signal processing unit by wireless communication in the form of Bluetooth. In addition, a device for housing the control unit is mounted on the rod, and at the end of the rod opposite to the end with the sensor there is a handle with an armrest. The control unit has corresponding programs and applications that allow reading signals transmitted by the coil. The control unit has a power button and a screen on which the type of metal object is determined, there is a noise suppression and signal amplification indicator, a depth indicator in percentages, the charge level of the main unit and sensor, buttons for turning on the hodograph and synograph.

The presence of wireless communication between the electronic control unit and detector using Bluetooth connection will allow faster signal transmission compared to metal detectors with wired connection. Signals from the search surface, which the coil receives and converts to digital signals, are transmitted to the control unit via Bluetooth. Using corresponding applications, the control unit manages the search process and provides comprehensive information about search results. The presence of an armrest increases ease of use.

The use of all essential features of the utility model will allow increasing the informativeness of searching for metal-containing objects, expanding the range of tasks that can be solved, and improving the ergonomics of the product.

Fig. 1 shows the general view of the metal detector.

Fig. 2 shows the external appearance of the control unit.

The metal detector includes rod 1, which is made with the ability to quickly change its length during operation to adapt to the user's height. Height is adjusted using locking nut 2. At end 3 of rod 1, using attachment mechanism 4, sensor 5 is installed with the possibility of rotation in space and quick removal, made in the form of a frame with crossbars, equipped with connection point 6 with the rod attachment mechanism. At end 7 of rod 1 there is handle 8 with armrest 9 for ease of use. In addition, device 10 for mounting control unit 11 is fixed on rod 1. The fixation of control unit 11 to rod 1 can have any form and should be convenient for a particular user. Control unit 11 may not be fixed on rod 1 of the metal detector, i.e., the user decides where to place it during the search.

Sensor 5 is linked to control unit 11 by wireless communication, for example using Bluetooth. Control unit 11 has corresponding programs and applications that allow freely reading signals transmitted by sensor 5 and allowing the user to respond accordingly. Using corresponding applications, control unit 11 manages the search process and provides comprehensive information about search results. Control unit 11 has power button 12 and screen 13 on which the type of metal object is determined, there is noise suppression and signal amplification indicator 14, depth indicator 15 in percentages, charge level of the main unit and sensor 5, buttons 17, 18 for turning on the hodograph and synograph.

The process of putting the device into operating condition is carried out as follows.

To put the unit into operating condition, it is necessary to press button 12 "on/off" for several seconds on control unit 11 and bring it to sensor 5 in the area of the right arc (where the charging connector is located). When the device starts working - there will be light indication on sensor 16 and the connection sign will light up on control unit 11. To turn off the device, it is necessary to press button 12 "on/off" on control unit 11 for several seconds. After this, a signal should sound in control unit 11 and the light indication on sensor 16 should turn off. If control unit 11 does not connect to sensor 5, then after 20 seconds sound indication will be activated and a flashing connection sign will be displayed on main screen 13. In such case, use of the device is impossible until the causes are eliminated.

The utility model and its practical implementation have the advantage of improved ergonomic characteristics due to the attachment mechanism connecting the detector and rod. This has made it possible to work with an armrest and handle and with a device for control unit 11 or without it. In any case, the possibility of individual adjustment of video surveillance within the range from 0° to 160° in the vertical plane relative to the rod axis is ensured.

The construction of the claimed utility model can be implemented using electromechanical and die-casting technologies. But mainly the manufacturing technology of the utility model is adapted to 3D printing technologies from polymer and composite materials such as ABS, PLA, etc.

The use of the proposed construction compared to existing ones will allow using the device for searching metal objects without using wires between the sensor and control unit, which, in turn, will allow the use of the sensor on robotic systems, quadcopters in hard-to-reach or dangerous places for humans at distances up to 100 meters (if necessary, it is possible to increase to the required value thanks to a signal amplifier).

UTILITY MODEL FORMULA

A metal detector comprising a sensor connected with the possibility of rotation to a rod and connected to a signal processing unit, characterized in that the sensor is made in the form of a frame with jumpers, equipped with a connection point with a rod mounting mechanism, the rod is made telescopic of at least two parts and has a locking nut, the sensor is connected to the signal processing unit by wireless communication in the form of Bluetooth, in addition, a device for placing a control unit is fixed on the rod, and at the end of the rod opposite to the end with the sensor, there is a handle with an armrest, while the control unit has appropriate programs and applications that allow reading signals transmitted by the coil, the control unit has a power button and a screen on which the type of metal object is determined, there is a noise suppression and signal amplification indicator, depth indicator in percentages, charge level of the main unit and sensor, buttons for turning on the hodograph and sinograph.

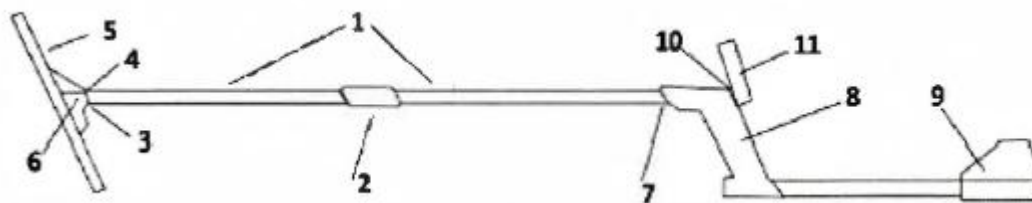


Fig. 1

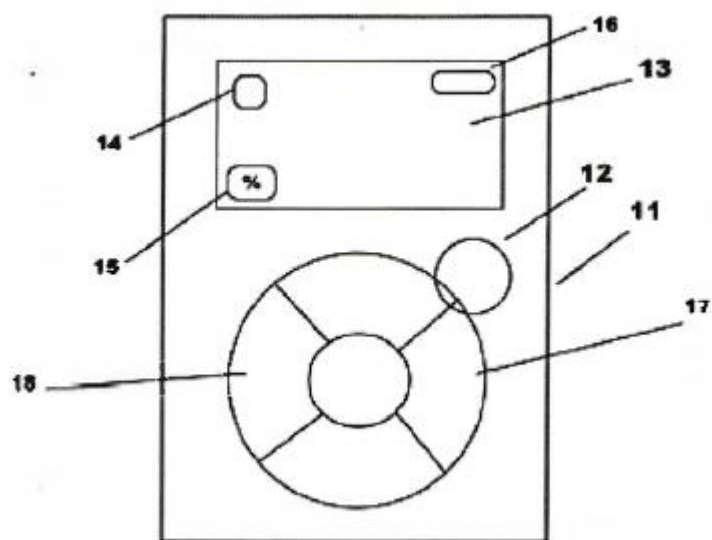


Fig. 2

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NATIONAL INTELLECTUAL PROPERTY AUTHORITY
STATE ORGANIZATION
“UKRAINIAN NATIONAL OFFICE
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24.07.2024 No. 2-19-24-2912-A

regarding utility model patent No. **156684**, application No.
u202400490 dated 30.01.2024

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In accordance with Article 25 of the Law of Ukraine "On Protection of Rights to Inventions and Utility Models" (hereinafter - the Law), we are sending you utility model patent No. **156684**.

The fee for the 1st year of validity of intellectual property rights to the utility model in the amount of UAH 180.00 (code - 13901) must be paid by 25.11.2024.

ATTENTION! From 16.09.2023, amendments entered into force that were introduced by Resolution of the Cabinet of Ministers of Ukraine dated 15.08.2023 No. 859, to the Procedure for Payment of Fees for Actions Related to Protection of Rights to Intellectual Property Objects, approved by Resolution of the Cabinet of Ministers of Ukraine dated 23.12.2004 No. 1716.

The amount and procedure for payment of fees for maintaining validity is determined by the Procedure for Payment of Fees for Actions Related to Protection of Rights to Intellectual Property Objects, approved by Resolution of the Cabinet of Ministers of Ukraine dated 23 December 2004 No. 1716.

The fee for each subsequent year is paid in accordance with Article 32 of the Law during the last 4 months of the current year of validity.

Advance payment of annual fees for maintaining the validity of intellectual property rights to a utility model for subsequent years is not provided for by legislation.

The term of validity of intellectual property rights to a utility model is calculated from the date of application filing.

Payment details for fees:

Recipient: UKRNOIPI Recipient code: 44673629 Recipient's bank: JSC CB "PRIVATBANK", Kyiv SWIFT: PBANUA2X Recipient's account (IBAN) in hryvnias (UAH): UA893052990000026004036240479 (980)	Payment purpose: Fee 13901, maintaining validity UM 156684 - UAH 180.00
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Payment details for fees in other currencies and information about main correspondent banks are posted on the UKRNOIPI website.

Head of Department for Ensuring

State Registrations of Industrial Property

/signature/

Sviatoslav LIASHCHENKO

Halyna MURLANOVA 494-05-68

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TRANSLATION AGENCY “ALPHABETA”

Confirms that the translation is performed by a competent translator. There are no erasures, amendments, crossed out words, unspecified emendations and other peculiarities. Translation is correct, complete and certified.

Acknowledges the authenticity of the signature of translator Dmytriieva Hanna Vitaliivna, who translated this Document from Ukrainian into English.

