



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 598 305 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
23.11.2005 Bulletin 2005/47

(51) Int Cl.7: **B66D 1/12**, B66D 1/14,
B66D 1/74

(21) Application number: **05075842.4**

(22) Date of filing: **05.04.2005**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL BA HR LV MK YU

(72) Inventor: **Mielec, Kjeld René Riis**
7323 Give (DK)

(74) Representative: **Olesen, Kaj et al**
Patentgruppen ApS
Arosgaarden
Aaboulevarden 31
8000 Aarhus C (DK)

(30) Priority: **21.05.2004 DK 200400158**

(71) Applicant: **KRM Holding ApS**
7323 Give (DK)

(54) **Powered winch handle for operating rotary winches on sailboats and a winch**

(57) The invention relates to a powered winch handle (3) for operating rotary winches (2) on sailboats. The handle comprises a housing (10,11), a power supply or a connection to an external power supply (9), drive means including an electric motor (4) connected to said power supply, and a transmission assembly (17) including first and second transmission devices (5,6) with interacting means (5a,6a), said first transmission device being connected to said drive means and said second transmission device being connected to a drum of said winch. The interacting means of said first and second transmission means interact perpendicularly and horizontally of each other.

The invention also relates to a winch for sailboats.

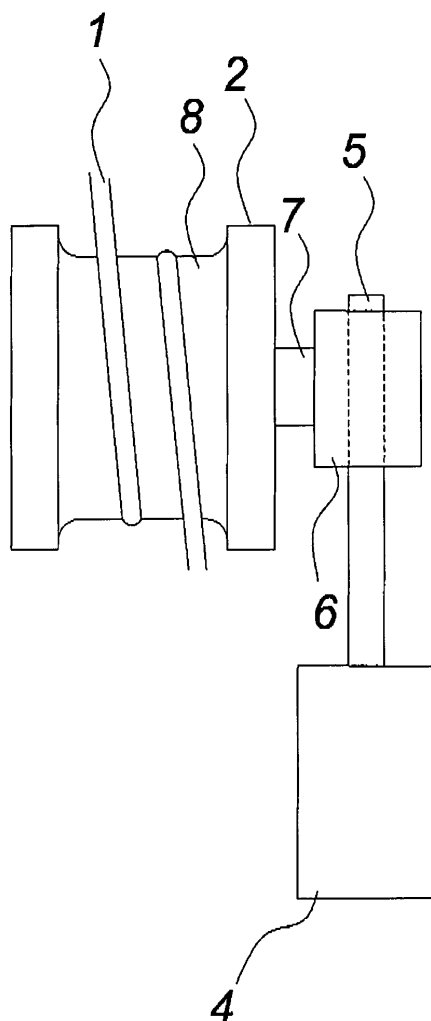


Fig. 1b

Description

Background of the invention

[0001] The invention relates to a powered winch handle for operating rotary winches on sailboats and a winch.

[0002] Winches are generally used on sailboats for tensioning or pulling running rig, usually by a line wound around the drum of the winch. Winches are especially used in raising the sails to their use position at the boat mast and controlling the position of the sails e.g. by using the halyard, the haul or the sheets. Further, winches are used to raise a crewmember to the top of the mast for maintenance as well as other onboard uses.

[0003] Winches are available in manually operated forms as well as forms driven by electrical means e.g. electric motors build into the housings of the winches. Examples of winches with build-in electric motors are stated in GB patent application Nos. GB-A 2317 844 and 2362 366.

[0004] However, the powered winches have the significant problem that they require significant space underneath the winches. Further, they are often installed as add-on features to existing sailboats i.e. require challenging modifications to the boat structure and electric systems.

[0005] International patent application No. WO-A 94/03390 states a powered winch handle for operating the winches on sailboats. The handle housing comprises connection means for the winch drum, drive means including a transmission assembly and an electric motor. The transmission assembly includes a sequence of beveled gears positioned on the longitudinal axis of the housing. A cable establishes connection to an external power supply. Alternatively, the handle may comprise a battery pack instead of the external power supply.

[0006] With the known powered winch handle it is possible to establish a handle which somewhat resembles a manual handle in size and as an arm for transferring moment to the winch. However, the known powered winch handle in a reasonable sized housing has proven to lack the necessary moment in raising and pulling the sails as well as locking the sails in a particular use position.

[0007] An object of the invention is to establish a powered winch handle without the abovementioned disadvantages and problems. It is especially an object of the invention to establish a handle that may provide the necessary moments in any normal use situation and particularly in relation to use situations on larger modern sailboats.

The invention

[0008] The invention relates to a powered winch handle for operating rotary winches on sailboats, said handle comprises a housing, a power supply or a connection

to an external power supply, drive means including an electric motor connected to said power supply, and a transmission assembly including first and second transmission devices with interacting means, said first transmission device being connected to said drive means and said second transmission device being connected to a drum of said winch, wherein said drive means and first transmission means interact and are positioned perpendicularly and horizontally in relation to said second transmission means.

[0009] Hereby are the abovementioned disadvantages of the prior art avoided. Further, it is possible to establish a winch handle with a high-ratio transfer of moment i.e. a high-ratio speed reduction in a limited and more squared space using a right angle. Hereby is possible to overcome the general understanding that the powered winch handle needs a long moment arm.

[0010] In an aspect of the invention, said transmission devices are positioned on a perpendicular line in relation to the longitudinal axis of the winch handle. Hereby, advantageous features have been achieved in relation to the invention e.g. a more compact handle.

[0011] In an aspect of the invention, said transmission assembly is at least one worm gear i.e. a worm screw with one or several threads as first transmission device and a worm wheel provided with a toothing to match and interact with the screw as second transmission device. Hereby, is established an advantageous embodiment of the invention.

[0012] In an aspect of the invention, said one or several threads establish an angle between 90° and 160° in relation to said longitudinal centre line. Hereby is established enough resistance in the transmission assembly to avoid back driving in the handle where the worm wheel turns the worm screw. The angles are such that the advantageous high-ratio speed reduction is achieved and the thread is substantially parallel with the worm wheel toothing. Consequently, the wheel needs to transform a substantially linear pressure to a rotating motion of the worm screw in order move it i.e. the angles establish a braking mechanism in the handle.

[0013] In an aspect of the invention, the frame of said drive means are bolted to the frame of said transmission assembly with a number of bolts. Hereby, is achieved a durable and secure handle where the different means are not forced from each other during heavy use.

[0014] In an aspect of the invention, said housing is established by a first and second housing part e.g. a top and bottom housing part with an O-ring gasket in between. Hereby it is possible to establish a watertight housing for the electric and mechanical features of the powered handle. The tightness of the housing is essential to the continuous performance of the handle in a sailboat environment and especially for the transmission assembly. Any leaks into the housing may easily and quickly reduce the interaction in the transmission assembly and result in malfunctions as well as short-circuiting in the electric systems.

[0015] In an aspect of the invention, at least one of said housing parts includes a number of supporting points for said transmission assembly. Hereby, it is ensured that the housing advantageously absorbs and upholds the moments of the transmission assembly.

[0016] In an aspect of the invention, said housing is made in an impact-strengthened plastic material. The environment of a sailboat is rough and harsh and consequently requests a durable housing of a powered winch handle.

[0017] In an aspect of the invention, said top housing part comprises hand gripping means with a control switch e.g. a switch with active positions for forward and reverse of the drive means as well as a passive dead-man control position. Use of equipment on a sailboat requests that the sailor can use one hand to maintain his position i.e. the handle must facilitate handling and control with just one hand.

[0018] In an aspect of the invention, said housing includes an overload unit with overload detection means disconnecting the drive means from the power supply and a safety switch for reconnecting the drive means to the power supply. The handle is hereby protected from overload situations e.g. damaging temperatures in the different means of the handle. With the avoidance of back driving it is possible wait for period and subsequently reconnecting the electric motor to the power supply.

Figures

[0019] The invention will be described in the following with reference to the figures in which

figs. 1a and 1b show schematically a first embodiment of a powered winch handle according to the invention, seen from above and the side respectively,

fig 2 shows the interaction between a first and second transmission means of a powered winch handle,

fig 3 shows a preferred embodiment of a hermetically sealed and encapsulated powered winch handle according to the invention, and

fig. 4 shows the interior of a top housing part of the powered winch handle shown in fig. 3.

Detailed description

[0020] Fig. 1a and 1b show a first embodiment of a powered winch handle 3 according to the invention and a winch 2. The winch and the handle are seen from above and the side, respectively.

[0021] The powered winch handle 3 is positioned above the winch and connected to it by a connection shaft 7. Hereby it is possible to tension or pull running rig of a sailboat by a line 1 wound around a drum 8 of the winch 2.

[0022] The powered winch handle 3 comprises drive means 4 including an electric motor with a cable connection to an external power supply. The drive means is connected to the connection shaft 7 through a transmission assembly comprising first and second transmission means 5, 6 with a high ratio speed reduction.

[0023] As illustrated in fig. 1a with the longitudinal centre line cl and perpendicular line pl of the winch handle, the drive means 4 and first transmission means 5 interact and are positioned perpendicularly and horizontally in relation to said second transmission means 6.

[0024] Fig. 2 shows the interaction between a first and second transmission means of an embodiment of the powered winch handle including a worm screw 5 and worm wheel 6.

[0025] The figure illustrates the positioning of the screw and wheel in relation to the longitudinal centre line cl and perpendicular line pl of the winch handle. Further, the angle α between the longitudinal centre line cl and the thread 5a of the worm screw 5 is illustrated. The angle defines the speed ratio between the worm screw 5 and the worm wheel.

[0026] Fig. 3 shows the interior of the hermetically sealed and encapsulated powered winch handle 3 comprising a built-in transmission assembly 17 and drive means 4. The drive means includes an electrically powered motor and is placed in the same horizontal level as the transmission assembly 17.

[0027] The bottom housing part 11 of the winch handle has a connection shaft 7 on the lower side. The connection shaft engages with the winch 2 at a winch opening or socket. The powered winch handle may through the connection shaft 7 rotate the winch drum and consequently may tension or pull running rig of the sailboat by a line 1 wound around the winch drum 8 (as especially illustrated in fig. 1b).

[0028] The two housing parts 10, 11 are assembled with six screws 14 around an o-ring gasket or seal 12 to secure that no water or humidity will percolate the sealed winch handle 3.

[0029] The hand gripping means 13 is placed on the top housing part 10 and is formed as a handle extending from one end of the upper surface to side surface of the other end. The hand gripping means is divided into a handling and use section by a transition section comprising a control switch 15. The transition section establishes a third connection between the hand gripping means 13 and the top housing part 10. Cables are positioned inside the connection wherein the cables connect the control switch with the motor control unit 18 and the electric motor 4. The control switch controls the direction of rotation of the motor and may actively be positioned in one of two positions that establish a forward

and reverse direction of the motor, respectively. When the switch is not activated it automatically moves into dead man's position i.e. disconnects the electric motor 4 from the power supply.

[0030] The powered winch handle 3 includes an overload unit with overload detection means that automatically disconnect the drive means 4 from the power supply in an overload situation. The top housing part 10 also has a safety switch 16 for reconnecting the drive means 4 to the power supply when the overload situation has ended. The safety switch is positioned at the top housing part 10 underneath the hand gripping means 13 and may be controlled by just one hand.

[0031] The weight balanced hand gripping means 13 ensures that the powered winch handle 3 can be mounted and demounted on the winch 2 by a sailor using only one hand. The sailor may for example hold the hand gripping means 13 in the handling section when he is mounting the handle. During use of the handle he may hold the hand gripping means in the lower use section. The control switch is hereby suitably placed on the transition between the lifting and use section of the hand gripping means and the control switch 16 may be controlled by using the same one hand holding the powered winch handle 3.

[0032] The electric motor 4 is connected to an external power supply by a cable extending through the cable opening 9 in the bottom housing part 11. The external power supply may be replaced by an internal battery pack in another embodiment of the invention.

[0033] Fig. 4 shows the interior of the top housing part 10 as well as the use section of the hand gripping means 13. The interior comprises the drive means 4 which is bolted to the transmission assembly 17 e.g. the electric motor bolted to a worm gear including a worm screw and wheel. Further, the interior comprises two watertight relays for the switching related to the control and safety switches. The figure also shows a house for carbon brushes or slip rings in connection with the external magnetization of the rotor in the electric motor 4.

[0034] The electric motor may be any type of AC and DC powered motor with an external magnetizing of the rotor or a rotor with permanent magnets. However, in an embodiment of the invention the electric motor is a DC powered motor with commutating means in magnetizing of the rotor. The DC motor is especially characterized by a high initial moment.

[0035] The interior also comprises a number of embedded support points 19 for fixation of the transmission assembly 17 as well as the electric motor 4.

List

[0036]

1. Line such as a halyard, a haul or sheets
2. Rotary winch
3. Powered winch handle

4. Drive means including an electric motor
5. First transmission device e.g. a worm screw
- 5a. Interacting means e.g. one or several threads
6. Second transmission device e.g. a worm wheel
- 5 6a. Interacting means e.g. toothing
7. Connection shaft between the winch and the powered winch handle
8. Winch drum
9. Cable opening for the connection to an external power supply
- 10 10. Top housing part
11. Bottom housing part
12. O-ring gasket
13. Hand gripping means
- 15 14. Fastening means such as a number of bolts
15. Control switch
16. Safety switch
17. Transmission assembly
18. Control unit for the electric motor
- 20 19. Numbers of embedded supporting points for the transmission assembly and electric motor
20. Holes for fastening means
21. House for carbon brushes
- α Thread angle
- 25 cl. Longitudinal centre line of the winch handle
- pl. Perpendicular line of the winch handle

Claims

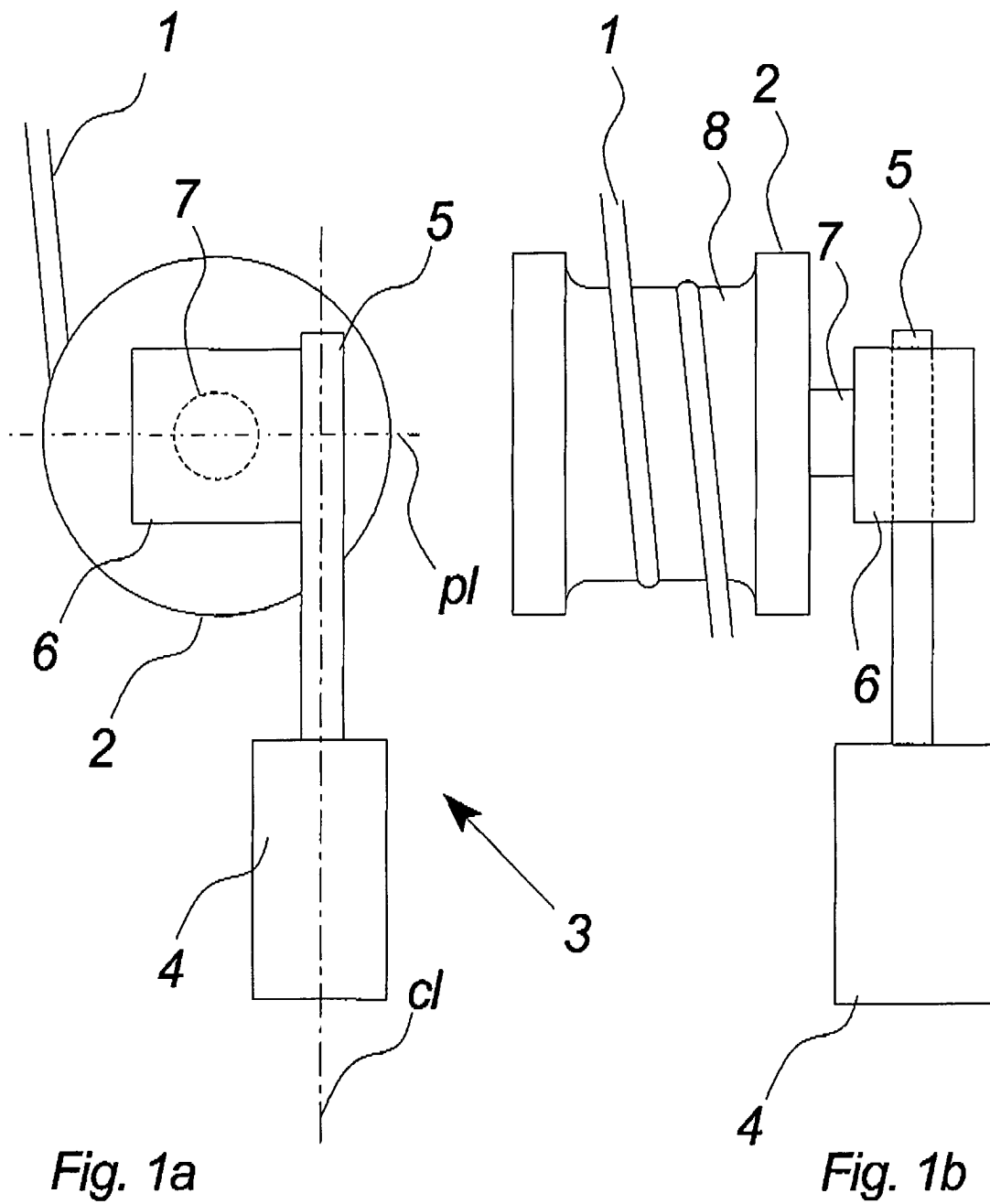
- 30 1. Powered winch handle (3) for operating rotary winches (2) on sailboats, said handle comprises a housing (10,11), a power supply or a connection to an external power supply (9),
35 drive means including an electric motor (4) connected to said power supply, and a transmission assembly (17) including first and second transmission devices (5, 6) with interacting means (5a, 6a), said first transmission device being connected to said drive means and said second transmission device being connected to a drum of said winch,
40 wherein
45 said drive means (4) and first transmission means (5) interact and are positioned perpendicularly and horizontally in relation to said second transmission means (6).
- 50 2. Powered winch handle (3) according to claim 1 wherein said transmission devices (5, 6, 17) are positioned on a perpendicular line (pl) in relation to the longitudinal centre line (cl) of the winch handle.
- 55 3. Powered winch handle (3) according to claim 1 or 2 wherein said transmission assembly (17) is at least one worm gear i.e. a worm screw (5) with one or several threads (5a) as first transmission device

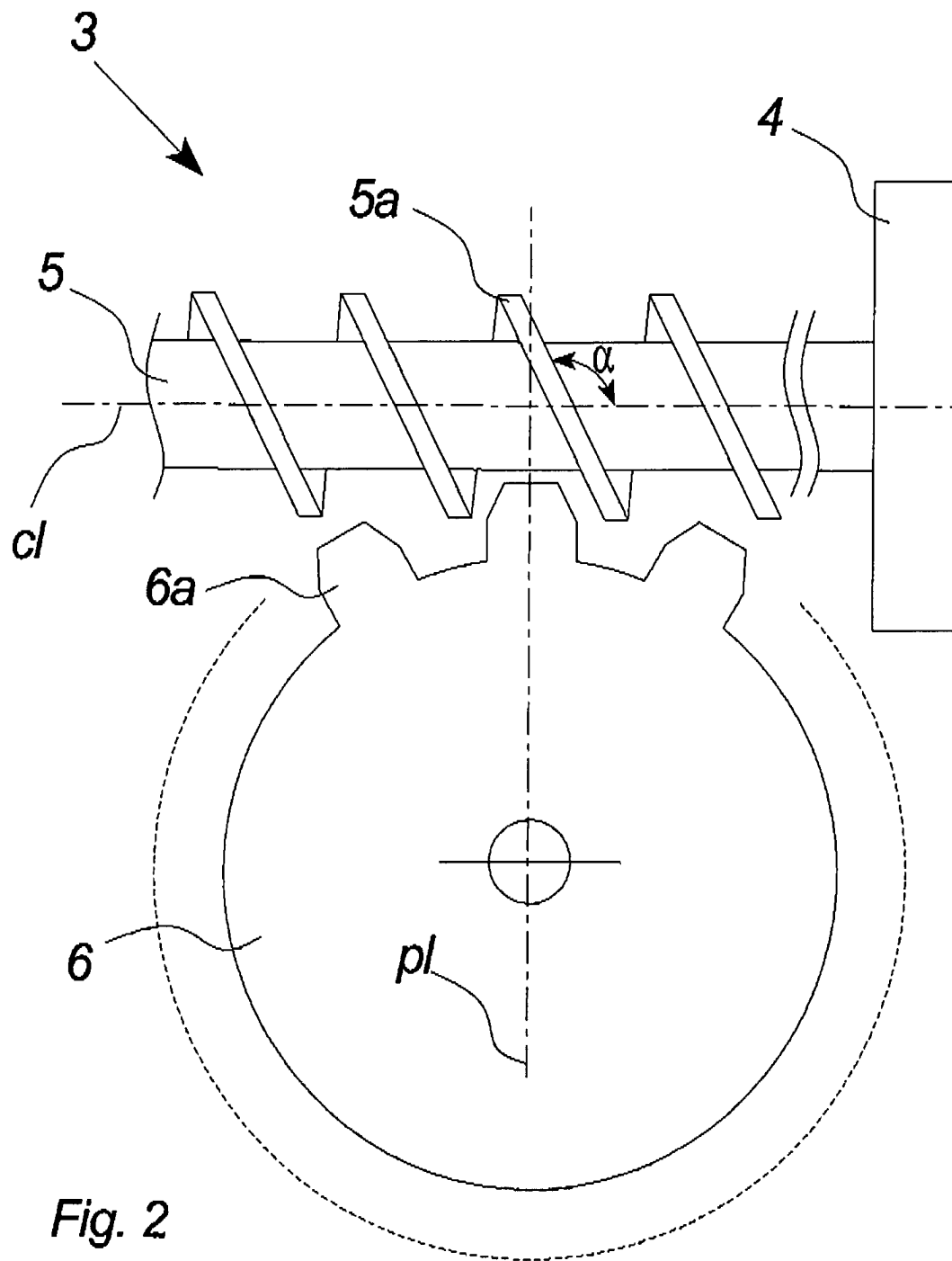
and a worm wheel (6) provided with a toothing (6a) to match and interact with the screw as second transmission device.

4. Powered winch handle (3) according to claim 3 5
wherein said one or several threads establish an angle (α) between 90° and 160° in relation to said longitudinal centre line (cl).
5. Powered winch handle (3) according to any of 10
claims 1 to 4 wherein the frame of said drive means (4) are bolted to the frame of said transmission assembly (17) with a number of bolts.
6. Powered winch handle (3) according to any of 15
claims 1 to 5 wherein said housing (10, 11) is established by a first and second housing part e.g. a top (10) and bottom housing part (11) with an O-ring gasket (12) in between. 20
7. Powered winch handle (3) according to claim 6
wherein at least one of said housing parts (10, 11) includes a number of supporting points (19) for said transmission assembly (17). 25
8. Powered winch handle (3) according to any of
claims 1 to 7 wherein said housing (10, 11) is made in an impact-strengthened plastic material.
9. Powered winch handle (3) according to any of 30
claims 3 to 8 wherein said top housing part (10) comprises hand gripping means (13) with a control switch (15) e.g. a switch with active positions for forward and reverse of the drive means (4) as well as a passive dead-man control position. 35
10. Powered winch handle (3) according to any of
claims 1 to 9 wherein said housing (10, 11) includes an overload unit with overload detection means disconnecting the drive means (4) from the power supply and a safety switch (16) for reconnecting the 40
drive means (4) to the power supply.
11. Winch for sailboats wherein a winch drum is rotated 45
by a powered winch handle (3) according to any of claims 1 to 10 in order to tension or pull running rig of the sailboat by a line (2) wound around the winch drum (8).

50

55





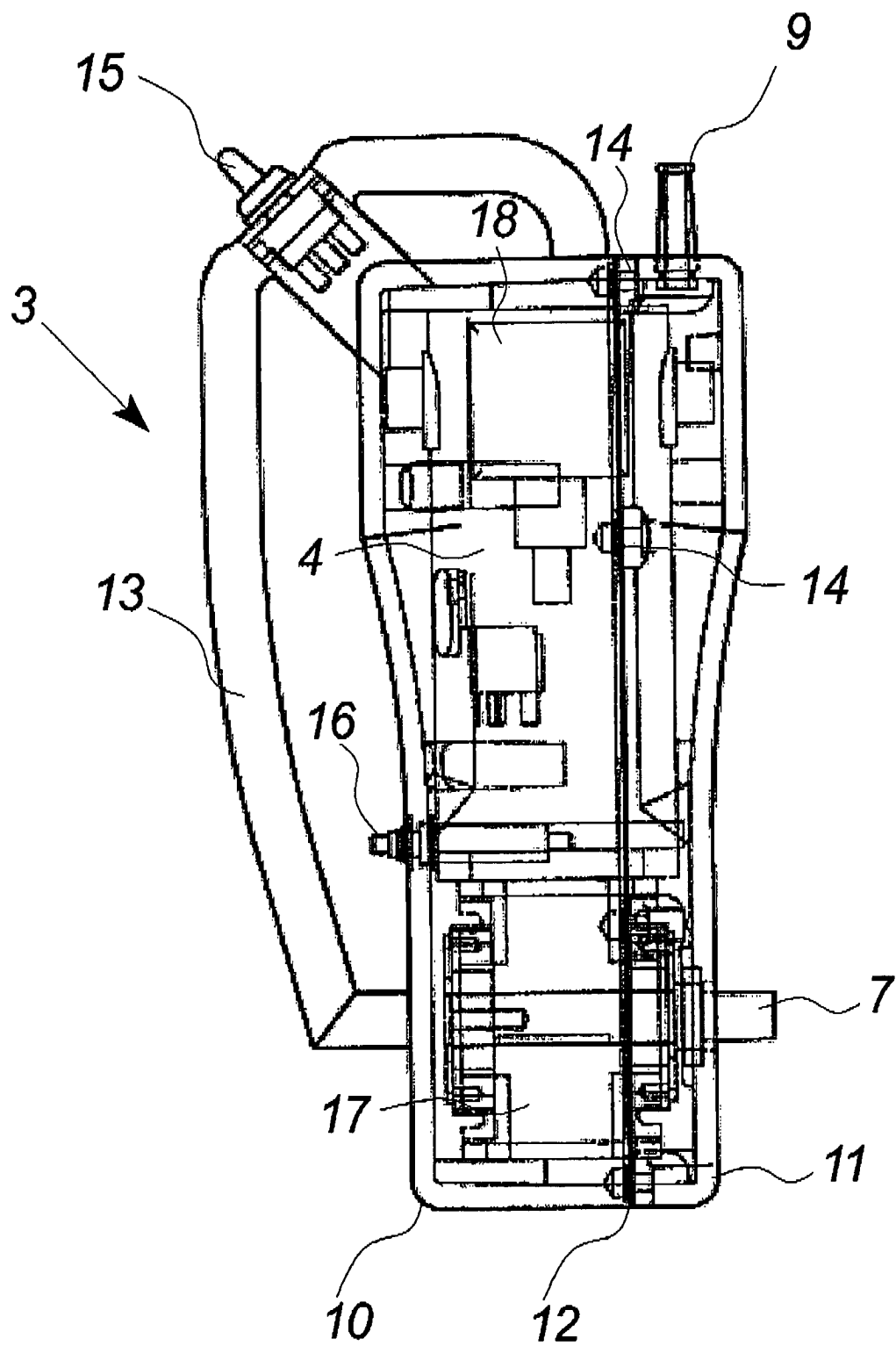


Fig. 3

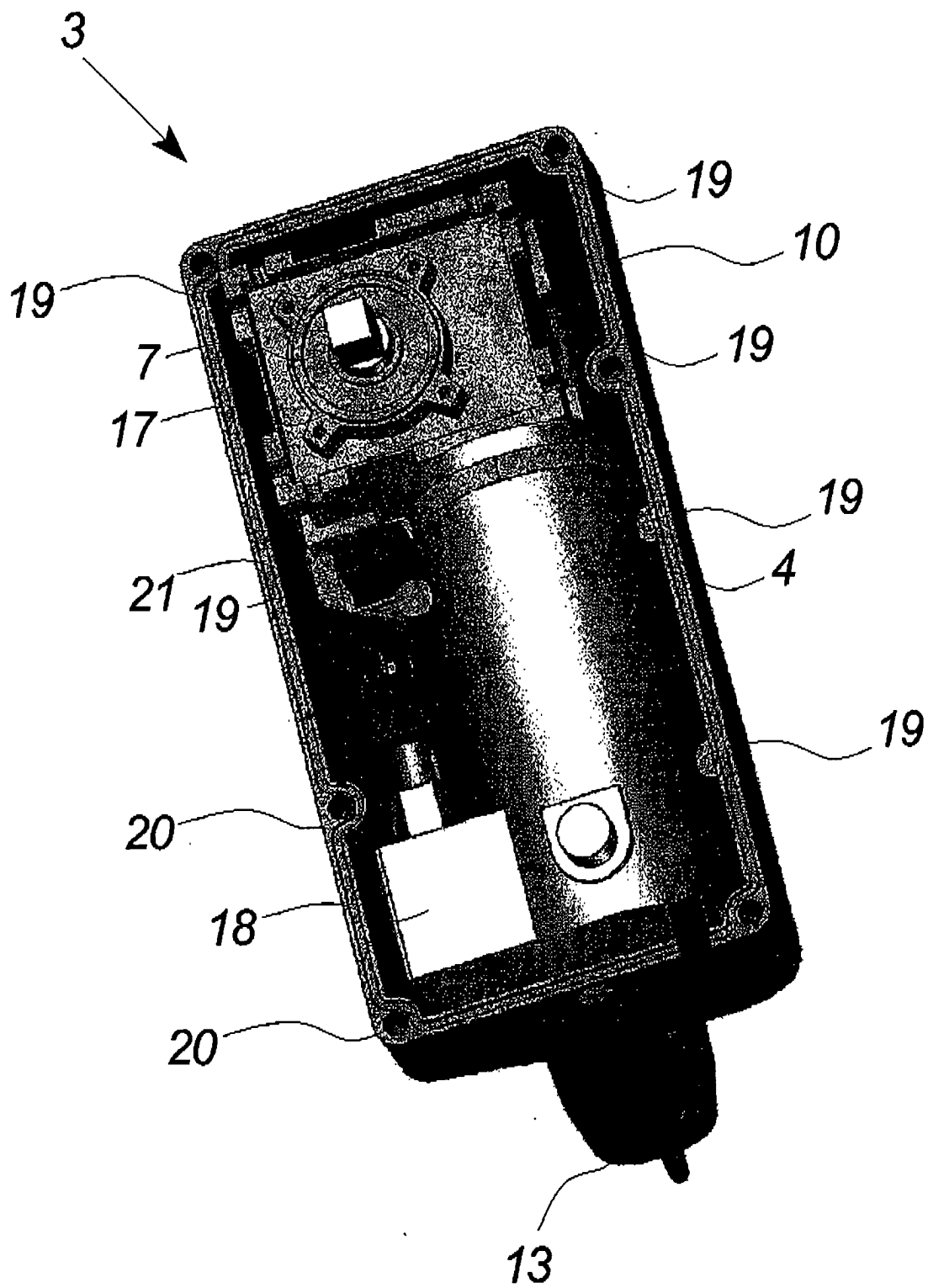


Fig. 4