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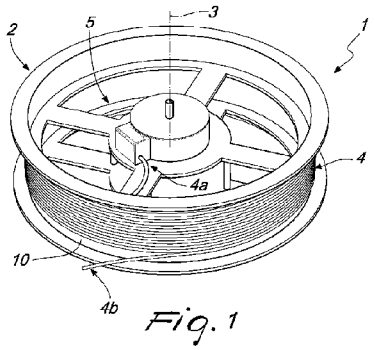

Fig. 1

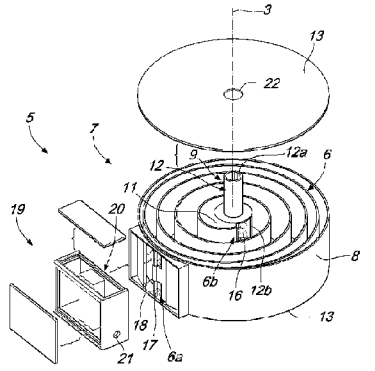

Fig. 2

(57) Abstract: A winding and unwinding device (1), particularly for power and/or signal transmission cables, comprising a drum (2) that rotates about a main axis (3) around which a flexible transmission cable (4) is wound at least partially which has a first end (4a) that is associated with the drum and a second end (4b) that is arranged opposite the first end (4a) and is associable with a user device. Connection means (5) are associated with the first end (4a) for functional connection to means (105) for supplying power and/or signals. The connection means (5) comprise a connecting cable (6) that has a first terminal (6a), associated with the first end (4a), and a second terminal (6b), arranged opposite the first terminal (6a) and associable with the supply means (105). The connecting cable (6) is furthermore accommodated, at least partly, in a containment element (7) that is provided with a perimetric barrier wall (8) that is associated so as to rotate integrally with the drum (2) and with which the first terminal (6a) is associated, and with a central core (9) that is locked rotationally with respect to the drum and with which the second terminal (6b) is associated. The device (1) enables, during its rotation, the unwinding or winding of the transmission cable (4) on the drum (2) and either or both of the winding of the connecting cable (6) around the central core (9) and the unwinding of the connecting cable (6) toward the internal side of the barrier wall (8).

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WINDING AND UNWINDING DEVICE, PARTICULARLY FOR POWER AND/OR SIGNAL TRANSMISSION CABLES

The present invention relates to a winding and unwinding device, particularly for power and/or signal transmission cables.

In the marine sector, the use is known of particular user devices for carrying out different activities, or operational missions, to be performed in depths. Such user devices are underwater vehicles, known as ROVs, which are provided with means of propulsion for their movement, manipulators or other devices for executing an operational mission, and telemetry signal communication units for remotely controlling said user device. The user device can be controlled by an operator by way of supply means that are connected to an adapted operational command unit that is normally arranged on the surface of a vessel proximate to the working point of the operational mission. The supply means and the user device are functionally connected to each other by means of a transmission cable (known in the technical jargon as an "umbilical") that makes it possible to transmit power, to supply the user device, and electrical/optical signals, to control it. For operational missions at great depths, a temporary accommodation structure is used for the user device which in turn is connected to the supply means by an adapted armored cable (known in the technical jargon as a "main lift"); the cable is armored in the sense that it is provided with a metallic outer jacket that is adapted to support the traction loads that arise especially during the launch and recovery of said user device by the vessel. The accommodation structure is provided with an adapted drum around which the transmission cable (known in the technical jargon as a "tether") is wound. Once the working depth under water has been reached, the user device is moved progressively away from the accommodation structure and an adapted winding and unwinding device unwinds the transmission cable from the drum in order to then rewind it onto the latter upon reentry of the user device into the parking seat.

A first type of winding and unwinding device comprises an arm that can move about the drum that is integral with the structure. Such arm is provided with a fairlead, through which the transmission cable passes, and which can move about the winding surface of the drum in order to wind or unwind said cable on or from the drum.

Such conventional devices are not devoid of drawbacks including the fact that they are very unreliable in use, since the large number of components, which are particularly complex, are frequently subject to numerous malfunctions, as a result requiring numerous maintenance operations even during the operational missions, thus greatly increasing the timescales and costs associated with said operational mission.

Another drawback of such conventional devices consists in the fact that their production has a high cost owing to the presence of many complex components, such as for example pulleys, lever mechanisms, gearwheels and servomotors, all appropriately designed to work synchronously.

Such drawbacks are partially overcome by a second type of device which is provided with a drum that can move with respect to the structure about an axis thereof, on the winding surface of which the transmission cable is wound and unwound. In this second type of device a first end of the transmission cable is integrally associated with the drum in rotation, while a second end is connected to the user device. In order to ensure the connection between the second end of the moving transmission cable and the fixed armored cable of the supply means, connection means are interposed between these latter two cables which ensure the transmission of power and/or signals. Such connection means comprise a rotating contact element, known as a slip ring, which comprises sliding contacts for electrical signals and connector elements with a prismatic cross-section for the passage of optical signals.

Such a type of device is not devoid of drawbacks either, including the fact that it has a low signal transmission efficiency, thus reducing the

signal/noise ratio, without ensuring the correct transmission between the operational command unit and the user device. In fact, the sliding contacts mainly comprise a stator that is provided with brushes that are in contact with circular paths formed on a rotor that is integral in rotation with the drum. Such brushes do not ensure a perfect adhesion to the corresponding contact path, resulting in the addition of a large amount of noise to the electrical transmission, which drowns out the useful signal. Such drawback is all the more exacerbated with connection means that are worn down after a high number of operating cycles, requiring frequent maintenance operations and consequent lack of use of the user device.

A further drawback of such conventional devices consists in the fact that they increase the risk of short-circuits and electrical discharges between adjacent contact paths, especially paths used for the transmission of power, and such short-circuits could irremediably damage the communication unit on board the user device.

Another drawback of such conventional devices consists in the fact that only a limited number of optical signals are transmitted, since it is not possible for connector elements with a prismatic cross-section, owing to an inherent geometric limitation, to transmit more than three signals simultaneously.

The aim of the present invention is to provide a winding and unwinding device, particularly for power and/or signal transmission cables, which eliminates the drawbacks, overcomes the limitations of the known art and is capable of offering the widest guarantees of reliability of use, by enabling the continuous use of the remotely controlled user device connected to it.

Within this aim, an object of the present invention is to provide a device that has a limited number of components, is easy to produce, and economically competitive when compared to the known art.

Another object of the invention is to provide a device that has a high

signal transmission efficiency in comparison to the known art, thus greatly increasing the signal/noise ratio.

Another object of the invention is to provide a device that eliminates the risk of short-circuit and/or of electrical discharges between the various adjacent conductors within the connection means.

Another object of the invention is to provide a device that enables the simultaneous transmission of a high number of optical signals.

This aim and these and other objects which will become more apparent hereinafter are all achieved by a winding and unwinding device, particularly for power and/or signal transmission cables, comprising a drum that rotates about a main axis around which a flexible transmission cable is wound at least partially which has a first end, associated with said drum, and a second end, arranged opposite said first end and associable with a user device, and connection means that are associated with said first end for functional connection to means for supplying power and/or signals, characterized in that said connection means comprise a connecting cable that has a first terminal, associated with said first end, and a second terminal, arranged opposite said first terminal and associable with said supply means, said connecting cable being accommodated at least partly in a containment element that is provided with a perimetric barrier wall which is associated so as to rotate integrally with said drum and with which said first terminal is associated, and with a central core that is locked rotationally with respect to said drum and with which said second terminal is associated, said device enabling, during its rotation, the unwinding or winding of said first transmission cable on said drum and either or both of the winding of said connecting cable around said central core and the unwinding of said connecting cable toward the internal side of said barrier wall.

Further characteristics and advantages of the invention will become more apparent from the description of a preferred, but not exclusive, embodiment of a winding and unwinding device, particularly for power

and/or signal transmission cables, which is illustrated by way of non-limiting example with the assistance of the accompanying drawings wherein:

Figure 1 is a schematic axonometric view of a winding and unwinding device, particularly for power and/or signal transmission cables, according to the invention;

Figure 2 is a partially exploded schematic view of the connection means of the device in Figure 1;

Figure 3 schematically illustrates a connecting cable arranged in a spiral, according to the invention;

Figure 4 is a cross-sectional schematic view of the connecting cable in Figure 3, along a transverse plane;

Figures 5 to 8 schematically show successive steps of unwinding the transmission cable, according to the invention, from the drum;

Figures 9 to 12 schematically show successive steps of winding the transmission cable, according to the invention, onto the drum;

Figure 13 is a schematic axonometric view of a temporary accommodation structure for a remotely controlled user device, according to the invention, which is provided with the winding and unwinding device.

With reference to the figures, the winding and unwinding device, particularly for power and/or signal transmission cables, generally designated with the reference numeral 1, comprises a drum 2 that rotates about a main axis 3 around which a flexible transmission cable 4 is wound at least partially which has two opposite ends the first 4a of which is associated with said drum and the second 4b of which is associable with a user device. The device 1 furthermore comprises connection means 5 that are associated with the first end 4a, for functional connection to means 105 for supplying power and/or signals, thus ensuring the transmission of power and the communication of signals, both in transmission and in reception, between the supply means 105 and the user device.

According to the invention, the connection means 5 comprise a connecting cable 6 that has a first terminal 6a, which is associated with the first end 4a of the transmission cable 4, and a second terminal 6b, which is arranged opposite the former and is associable with the supply means 105. The connecting cable 6 is accommodated, at least partly, in a containment element 7 that is provided with a perimetric barrier wall 8 which is associated so as to rotate integrally with the drum 2 and with which the first terminal 6a is also associated. The containment element 7 also has a central core 9 that is locked rotationally with respect to the drum 2 and with respect to the barrier wall 8, and with which the second terminal 6b is associated. During the rotation of the device 1, the transmission cable 4 is unwound from or wound onto the drum 2 in order to move the second end 4b away from or back toward said device and, simultaneously, the connecting cable 6 is wound onto the central core 9 and/or is unwound toward the internal side, adhering thereto, of the barrier wall 8.

The drum 2, around which the transmission cable 4 is wound, has a transverse space occupation, with respect to the main axis 3, that is greater than the transverse space occupation of the central core 9. In particular, the central core 9 has a second surface 11 for winding the connecting cable 6, which is smaller than a first surface 10 of the drum 2 for winding the transmission cable 4. Both surfaces 10 and 11 are substantially cylindrical and the first winding surface 10 has a longer base perimeter than the second winding surface 11. Conveniently, the first and second winding surfaces 10 and 11 and the barrier wall 8 are substantially cylindrical with a circular end face, are mutually coaxial and extend along the main axis 3. The first winding surface 10 furthermore has a larger base diameter than the barrier wall 8.

Conveniently, the central core 9 is a hollow shaft 12 that is provided with a head opening 12a and with a lateral opening 12b. The lateral opening 12b is provided in the second winding surface 11 thus facilitating the

insertion of the second terminal 6b of the connecting cable 6 into the hollow shaft 12 and the egress of the same from the head opening 12a. The connecting cable 6 has, between its two terminals 6a and 6b, a substantially ribbon-like central body that is provided with two mutually opposite main faces. Such a shape structure facilitates the winding of the connecting cable around the second winding surface 11. The connecting cable 6 is furthermore arranged with a spiral orientation around the main axis 3 inside the containment element 7, which defines a containment chamber that is substantially closed thanks to the presence of two closure walls 13, each one of which is associated with the opposite edges of the barrier wall 8. Conveniently, the distance between the two closure walls 13, i.e. the height of the barrier wall 8, is substantially identical with or slightly greater than the width of the central body of the connecting cable 6, in this manner preventing the crossing of one portion of said connecting cable with respect to another, adjacent portion thereof during winding or unwinding.

Advantageously, the device 1 comprises elastic means 14 that are associated with the connecting cable 6 in order to bring the latter closer to the barrier wall 8. In particular, the elastic means 14 tend to straighten the portions of the cable with which they are associated and, consequently, widen the radius of curvature of the connecting cable 6 to a size that is substantially equal to the base radius of the barrier wall 8. Advantageously, the elastic means 14 prevent the connecting cable 6 from being curved with radii of curvature below a critical size below which the optical fibers that are accommodated inside the connecting cable could be damaged or might not allow an adequate passage of the signal. In particular, such elastic means 14 comprise a linearly extending lamina made of spring steel and associated with the connecting cable 6 over its entire length. Furthermore, the connecting cable 6 has, at each of its terminals 6a and 6b, a connecting joint 15 that is associated, so that it can rotate, with respective retention means 16 and 17. A first means for retaining 16 is arranged at the lateral opening 12b

and is integral with the hollow shaft 12, while a second means for retaining 17 is arranged at a through hole 18, defined in the barrier wall 8 for the passage of the first terminal 6a toward the outside, and is integral in rotation with the barrier wall. At the through hole 18, outside the containment element 7, a box-like element 19 accommodates on its inside at least two mutually connected connectors, not shown in the accompanying figures, which allow the passage of power, electrical signals, optical signals or other types of signals that can be transmitted over a cable. Each one of the two connectors is connected functionally respectively to the first end 4a or to the first terminal 6a for the transmission of power and/or signals between the transmission cable 4 and the connecting cable 6, and is integral with the other, i.e. they are are mutually locked in rotation and in translational motion. Depending on the type of conductors (electrical or optical) and depending on the number of conductors in the cables 4 and 6, each connector enables the passage of power or of a signal without introducing noise over the useful signal since the connection is of the static type. Furthermore, the presence of multiple conductors, such as for example four or more optical fibers, requires only the presence of respective adjacent connectors, with no limit of the maximum number of signals that can be transmitted simultaneously. The connecting cable 6 and the transmission cable 4 enter the inside of the box-like element 19 through two respective entry openings 20 and 21, the first 20 of which is arranged at the through hole 18.

Conveniently, the device 1 is provided with drive means, not shown in the accompanying figures, which enable the rotation of the drum 2 about the main axis 3, in the two directions of rotation, alternately.

The device 1 thus described can be associated with a temporary accommodation structure 100 for remotely controlled user devices, such as for example underwater vehicles, which is defined mainly by a base frame 101 that is provided with a seat 102 for parking the user device. In

particular, the drum 2 is associated so as to be movable in rotation with respect to the base frame 101 for the unwinding or winding of the transmission cable 4 and the central core 9 is associated integrally with the base frame. The remotely controlled user device, which is connected to the second end 4b, is controlled and powered by the supply means 105 which are connected to an operational command and control unit, which is located remotely from the accommodation structure 100.

In this particular embodiment, illustrated in the accompanying figures, the containment element 7 and the box-like element 19 are both watertight and contain a compensating fluid, such as for example oil, in order to contrast the outer pressure, which is particularly high at marine depths. Furthermore, the two elements 7 and 19 are mutually connected through the through hole 18 (which fits together with the first passage opening 20) and respectively have an eyelet 22, which is provided in a closure wall 13, for the passage of the hollow shaft 12 and of the second terminal 6b inside it and a second passage opening 21 for the entry of the first end 4a.

Conveniently, the first passage opening 21 and the eyelet 22 are provided with adapted gaskets to ensure the watertight seal of the two elements 7 and 19. The central body of the connecting cable 6, inside the containment element 7, has a flattened rectangular cross-section which centrally accommodates the lamina made of spring steel and laterally the various conductors, electrical wires or optical fibers, as illustrated in Figure 4.

At the two terminals 6a and 6b the various conductors exit from the flat body, and the lamina made of spring steel is connected to the joints 15 that are formed by a ferrule that is rotatably fitted on the respective retention means 16 and 17, which in turn are defined by shanks that are respectively integral with the hollow shaft 12 and with the box-like element 19, as illustrated in Figure 2.

The hollow shaft 12, at the head opening 12a, is integral with a bracket 103 that is fixed to the base frame 101. Accommodated on the bracket 103 is an additional connection box 104, also watertight, which is connected with the head opening 12a for the entry of the second terminal 6b.

The additional connection box 104 contains conventional connectors, which are identical with the connectors in the box-like element 19, for the connection of the connecting cable 6 with the supply means 105, which are defined at least in part by an armored cable.

Such armored cable is connected to the operational command unit of the remotely controlled user device which, in this embodiment, is a remotely controlled vehicle for marine use.

In order to facilitate the correct winding and unwinding of the transmission cable 4 onto/from the drum 2, the accommodation structure 100 comprises a cable guide 106 of the conventional type. Below the device 1, the base frame 100 has the seat 102 for parking the remotely controlled vehicle.

The operation of the winding and unwinding device, particularly for power and/or signal transmission cables, is described below.

The accommodation structure 100, with the remotely controlled vehicle accommodated in the parking seat 102, is launched, i.e. it is submerged in the water and, by way of the armored cable, reaches the desired depth. In this phase the transmission cable 4 is completely wound on the first winding surface 10 and the connecting cable 6 is completely wound on the second winding surface 11, as illustrated in Figure 5.

The egress of the vehicle, i.e. of the user device, from the parking seat 102 requires the unwinding of the transmission cable 4 by way of the rotation of the drum 2 in the direction of rotation indicated with the letter A in Figure 5 and the simultaneous unwinding of the connecting cable 6 from the second winding surface 11.

Such unwinding is facilitated by the presence of the lamina made of spring steel, which tends to straighten the connecting cable, consequently widening the radius of curvature of its spiral and making it adhere to the internal side of the barrier wall 8. Advantageously, the drum 2 and the containment element 7 have identical angular speeds, since being integral in rotation, but with different sizes, they enable the simultaneous unwinding of a different quantity of cables 4 and 6. In particular, one complete turn of the drum 2 enables the unwinding of a larger quantity of transmission cable 4 wound on the first winding surface 10 with respect to the quantity of connecting cable 6 that is unwound in the same turn, such quantity being proportionally less than the former in accordance with the ratio of the respective base diameters of the two surfaces for winding 10 and 11. The continuous unwinding of the transmission cable 4 leads to a complete unwinding of the connecting cable 6 onto the internal side of the barrier wall 8, as illustrated in Figure 6. The step of unwinding can continue since the connecting cable 6, thanks to the joint 15 associated with the first means 16 for retaining, rotates about the axis that passes through the first means for retaining, varying its orientation, and begins to wind around the second winding surface 11, as illustrated in Figure 7. The progressive distancing of the vehicle, with consequent unwinding of the transmission cable 4, ends when the connecting cable 6 is completely wound onto the second winding surface 11, as illustrated in Figure 8.

The recovery of the vehicle, at the end of the operational mission, requires winding of the transmission cable 4 onto the first winding surface 10 by way of the rotation of the drum 2 in the direction opposite to the direction of rotation described previously, such direction of rotation being indicated with the letter B.

The winding of the transmission cable 4 involves the simultaneous unwinding of the connecting cable 6 from the second winding surface 11, as illustrated in Figure 9, toward the internal side of the barrier wall 8, as

illustrated in Figure 10. The winding of the transmission cable 4 continues on the first winding surface 10, while the connecting cable 6 enters the phase of winding onto the second wall for winding 11, as illustrated in Figure 11, until it is completely wound thereon, as illustrated in Figure 12, thus returning to the initial configuration, as illustrated in Figure 5, and allowing the reentry of the vehicle into the parking seat 102.

The first terminal 6a, thanks to the corresponding joint 15 associated with the second means for retaining 17, also rotates about the axis that passes through the second means for retaining, thus ensuring the continuous transmission of power and signals through the conductors in the connecting cable 6, while allowing the orientation of the first terminal 6a in two opposite directions in the various steps of winding and unwinding.

During the steps described of winding and unwinding, the transmission cable 4 is kept under tension, and conveniently oriented, by the cable guide 106 for a correct winding onto the first winding surface 10.

Advantageously, the size difference of the surfaces for winding 10 and 11 and the band-like geometric shape of the connecting cable 6 enable the unwinding of a large quantity of transmission cable 4 for a limited length of the connecting cable 6. Furthermore, the ability to unwind the connecting cable 6 from the second winding surface 11 and subsequently rewind said cable onto the same surface, without varying the direction of rotation of the drum 2, makes it possible to unwind or wind double the quantity of transmission cable 4 with the same quantity of connecting cable 6.

In practice it has been found that the winding and unwinding device, particularly for power and/or signal transmission cables, according to the present invention, achieves the intended aim and objects in that it has high reliability of use, thus ensuring the continuous use of the device. In fact, the components used, which are particularly simple, have a far lower risk of malfunctioning than conventional devices, without therefore interrupting the

use of remotely controlled user devices during an operational mission. Furthermore, due to the presence of a limited number of components that are simple to produce, the device is economically competitive when compared to the known art.

Another advantage of the device, according to the invention, consists in the fact that it ensures a high level of efficiency of signal transmission, increasing the signal/noise ratio. In fact, the various connectors of the cables for the transfer of signals are mutually integral and free from contact elements of the rotating type which could add noise to the useful signal. Furthermore, there being no movement between the connectors, the various conductors cannot accidentally come into contact with each other, thus avoiding the possibility of giving rise to short-circuits or electrical discharges.

Another advantage of the device, according to the invention, consists in that it can transfer a high number of signals, both electrical and optical, while requiring only the presence of respective conventional static connectors, mutually laterally adjacent.

The device described can be used on its own or in association with other machinery for transferring power and/or signals between two opposite terminals that are connected to each other via cable and are designed to be moved away from each other, both in the marine sector and in other sectors.

In other embodiments, the possibility is not excluded of accommodating the device described directly on board a mobile user device, connecting the second end of the transmission cable to a unit for the operational command and power supply of the user device.

The winding and unwinding device, particularly for power and/or signal transmission cables, thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

Moreover, all the details may be substituted by other, technically

equivalent elements.

In practice the materials employed, provided they are compatible with the specific use, and the contingent dimensions and shapes, may be any according to requirements.

The disclosures in Italian Patent Application No. MO2013A000070 from which this application claims priority are incorporated herein by reference.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

CLAIMS

1. A winding and unwinding device (1), particularly for power and/or signal transmission cables, comprising a drum (2) that rotates about a main axis (3) around which a flexible transmission cable (4) is wound at least partially which has a first end (4a), associated with said drum, and a second end (4b), arranged opposite said first end (4a) and associable with a user device, and connection means (5) that are associated with said first end (4a) for functional connection to means (105) for supplying power and/or signals, characterized in that said connection means (5) comprise a connecting cable (6) that has a first terminal (6a), associated with said first end (4a), and a second terminal (6b), arranged opposite said first terminal (6a) and associable with said supply means (105), said connecting cable (6) being accommodated at least partly in a containment element (7) that is provided with a perimetric barrier wall (8) that is associated so as to rotate integrally with said drum (2) and with which said first terminal (6a) is associated, and with a central core (9) that is locked rotationally with respect to said drum and with which said second terminal (6b) is associated, said device (1) enabling, during its rotation, the unwinding or winding of said transmission cable (4) on said drum (2) and either or both of the winding of said connecting cable (6) around said central core (9) and the unwinding of said connecting cable (6) toward the internal side of said barrier wall (8).

2. The device (1) according to claim 1, characterized in that said drum (2) has a transverse space occupation, with respect to said main axis (3), that is greater than the transverse space occupation of said central core (9).

3. The device (1) according to one or more of the preceding claims, characterized in that said drum (2) has a first surface (10) for winding said transmission cable (4) and said central core (9) has a second surface (11) for winding said connecting cable (6), said first winding surface (10), said second winding surface (11) and said barrier wall (8) having a substantially

cylindrical shape with a circular end face that extends along said main axis (3), said first winding surface (10) having a base diameter that is larger than the base diameter of said second winding surface (11) and of said barrier wall (8).

4. The device (1) according to one or more of the preceding claims, characterized in that said central core (9) is a hollow shaft (12) that is provided with a head opening (12a) and with a lateral opening (12b) for the passage, between said two openings (12a, 12b), from the inside of said shaft, of said second terminal (6b), said lateral opening (12b) being provided in said second winding surface (11).

5. The device (1) according to one or more of the preceding claims, characterized in that said connecting cable (6) has a substantially ribbon-like central body that is provided with two mutually opposite main faces and is arranged with a spiral orientation around said main axis (3) within said containment element (7).

6. The device (1) according to one or more of the preceding claims, characterized in that said containment element (7) comprises two closure walls (13), each associated with the two opposite edges of said barrier wall (8), said body of said connecting cable (6) having a width that is substantially equal to the distance between said two closure walls (13).

7. The device (1) according to one or more of the preceding claims, characterized in that it comprises elastic means (14) that are associated with said connecting cable (6) for moving said connecting cable toward said barrier wall (8) during the unwinding of said connecting cable (6) toward the internal side of said barrier wall.

8. The device (1) according to claim 7, characterized in that said elastic means (14) comprise a linearly extending lamina made of spring steel and associated with said connecting cable (6) over its entire length.

9. The device (1) according to one or more of the preceding claims, characterized in that said connecting cable (6) has, at each one of said first

and second terminals (6a, 6b), a connecting joint (15) that is associated, so that it can rotate, with respective retention means (16, 17), a first one of said retention means (16) being arranged at said lateral opening (12b) and being integral with said hollow shaft (12) and a second one of said retention means (17) being arranged at a through hole (18) that is provided in said barrier wall (8) for the passage of said first terminal (6a) toward the outside of said containment element (7).

10. The device (1) according to one or more of the preceding claims, characterized in that it comprises a box-like element (19) that contains at least two mutually connected connectors, each one of said at least two connectors being connected functionally respectively to said first end (4a) or to said first terminal (6a) for the transmission of power and/or signal between said transmission cable (4) and said connecting cable (6), said at least two connectors being integral with each other.

11. A temporary accommodation structure (100) for remotely controlled user devices, comprising a base frame (101) that is provided with a seat (102) for parking a remotely controlled user device, characterized in that it comprises at least one winding and unwinding device (1), particularly for power and/or signal transmission cables, according to one or more of the preceding claims, said drum (2) being associated so as to be movable in rotation with respect to said base frame (101) for the unwinding or winding of said transmission cable (4) and said central core (9) being integrally associated with said base frame (101), said second end (4b) being connected to said user device for the control and/or supply of said user device by said supply means (105) that are functionally connected to said second terminal (6b).

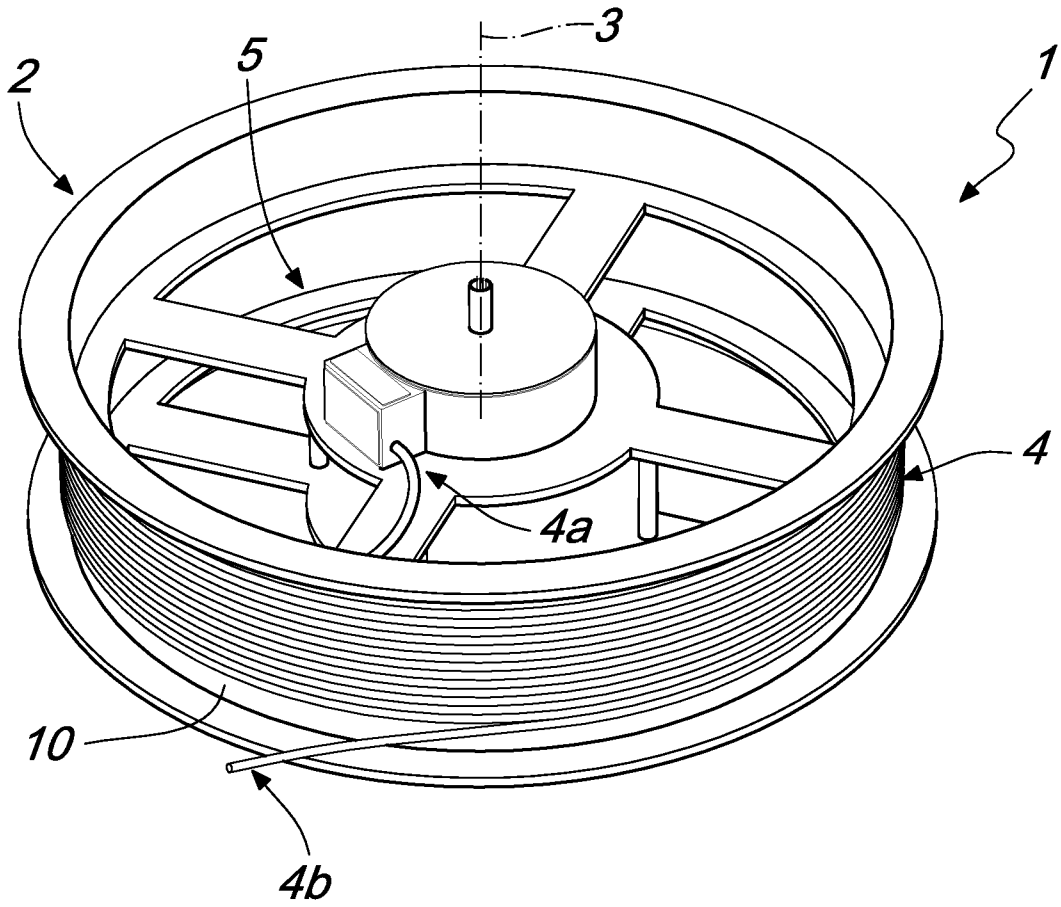

Fig. 1

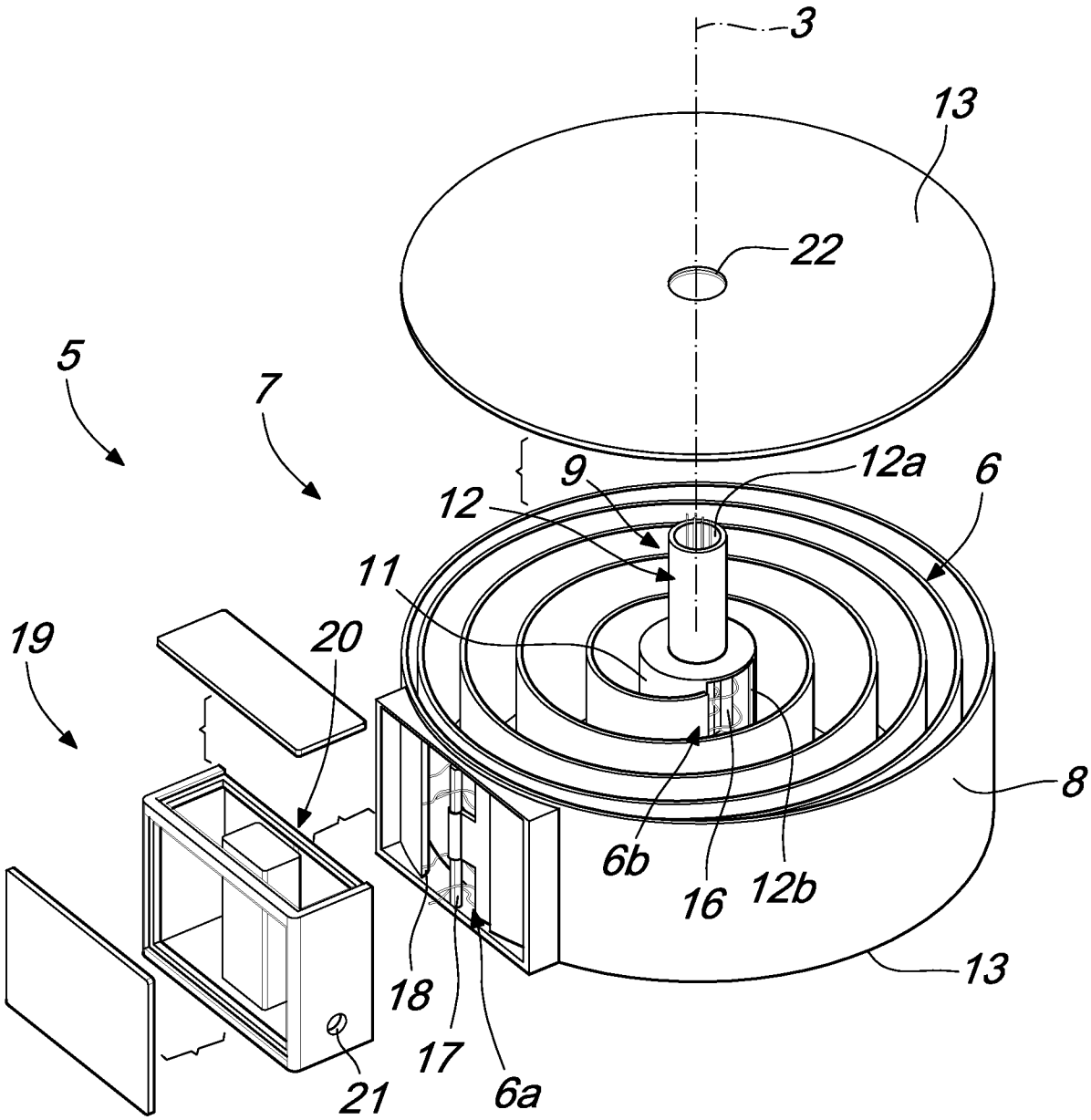

Fig. 2

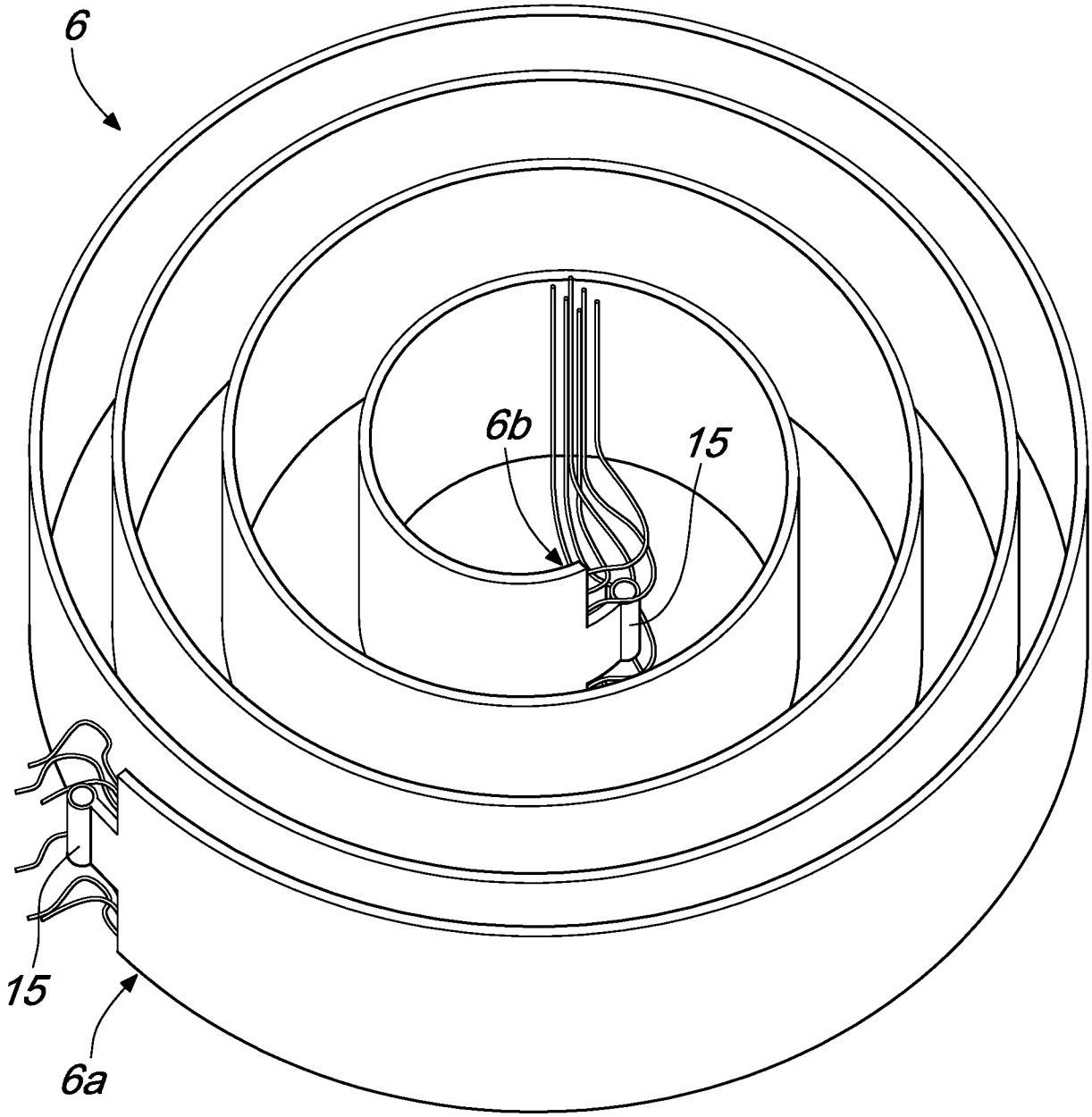

Fig. 3

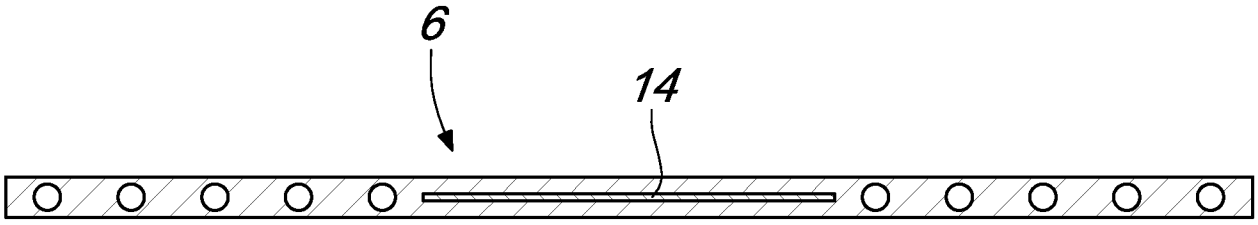

Fig. 4

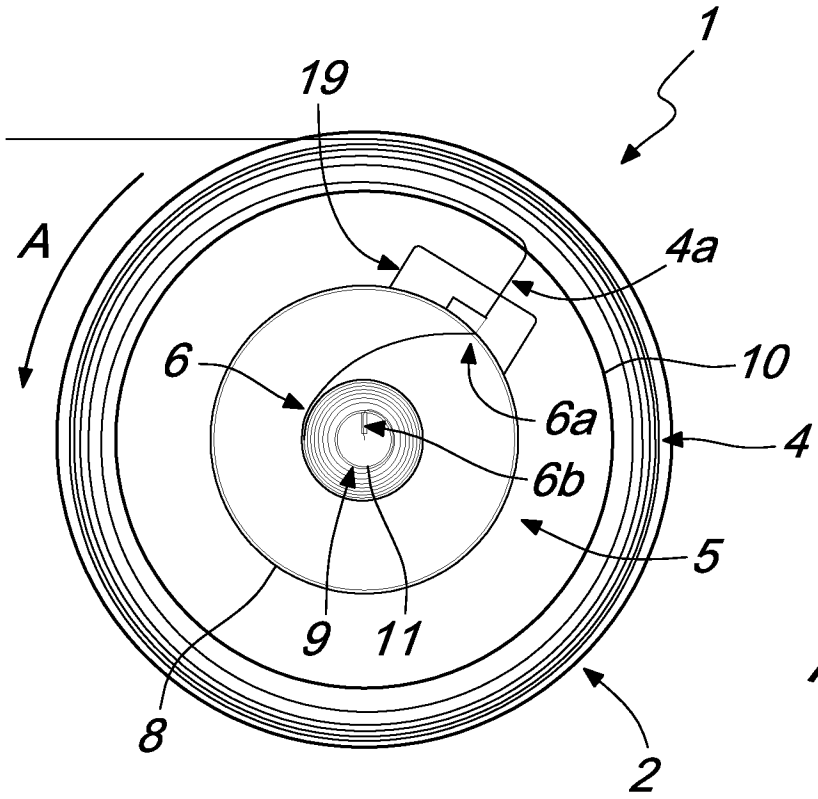

Fig. 5

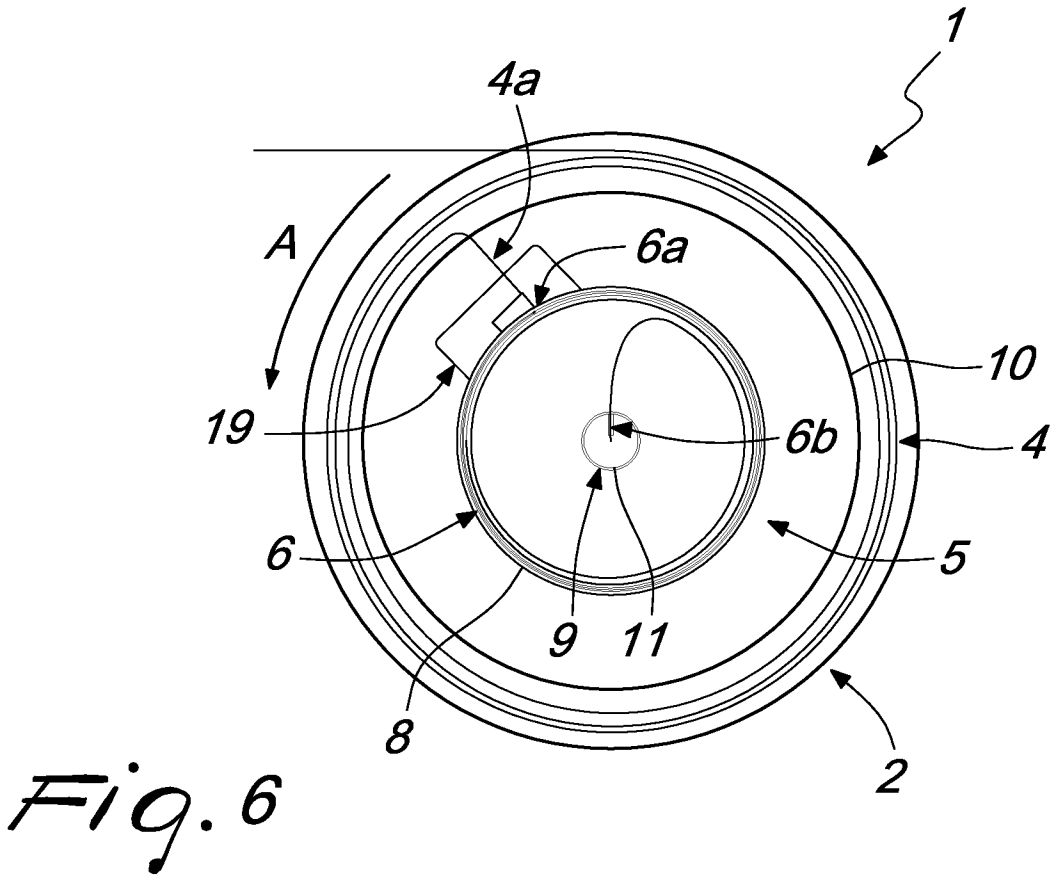

Fig. 6

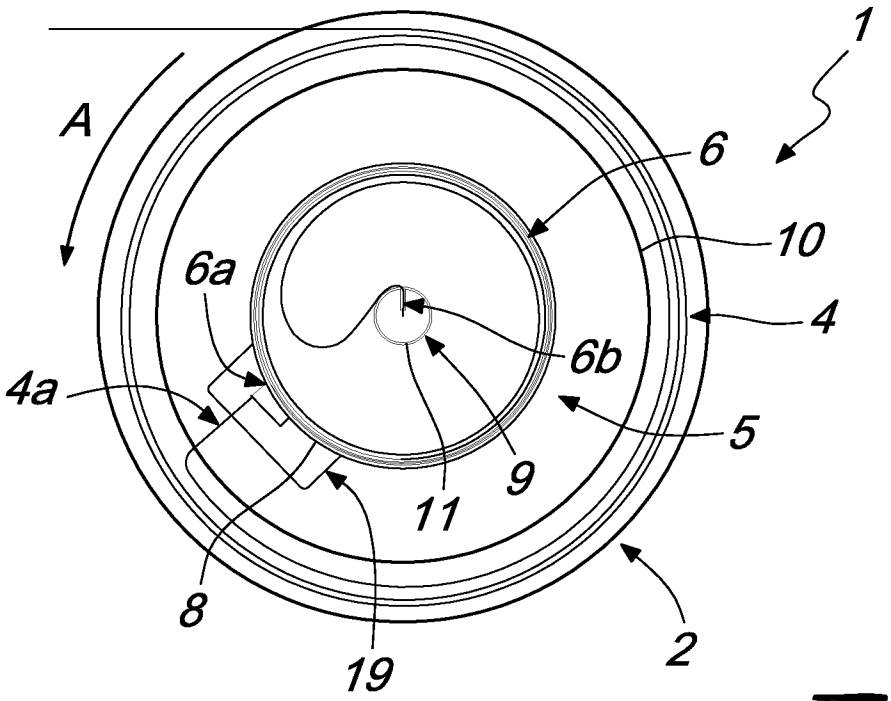

Fig. 7

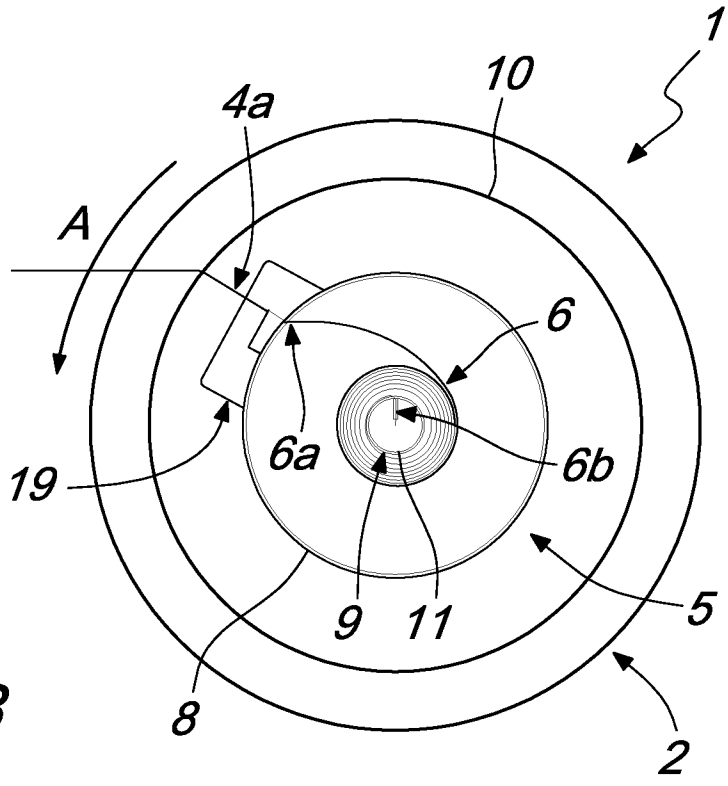

Fig. 8

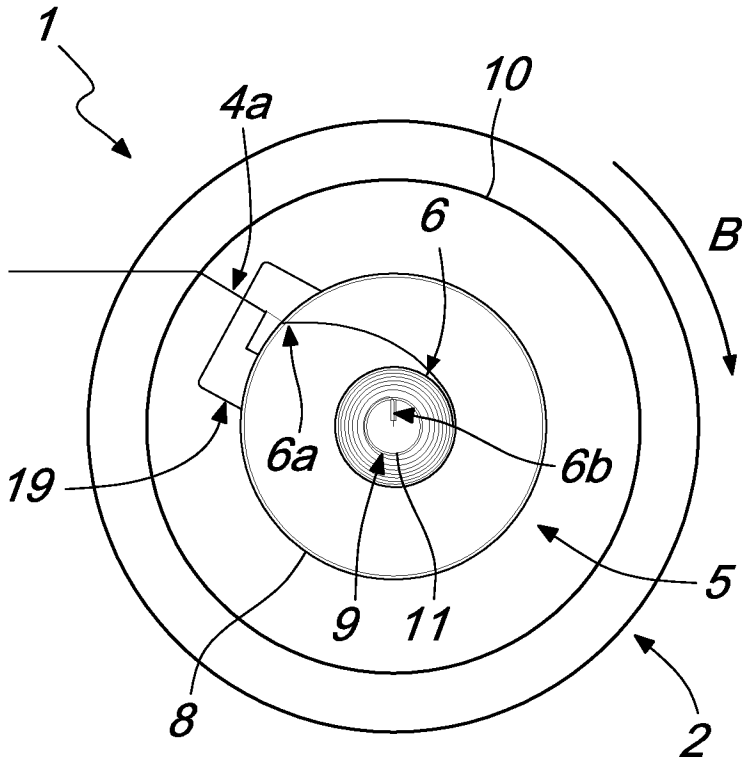

Fig. 9

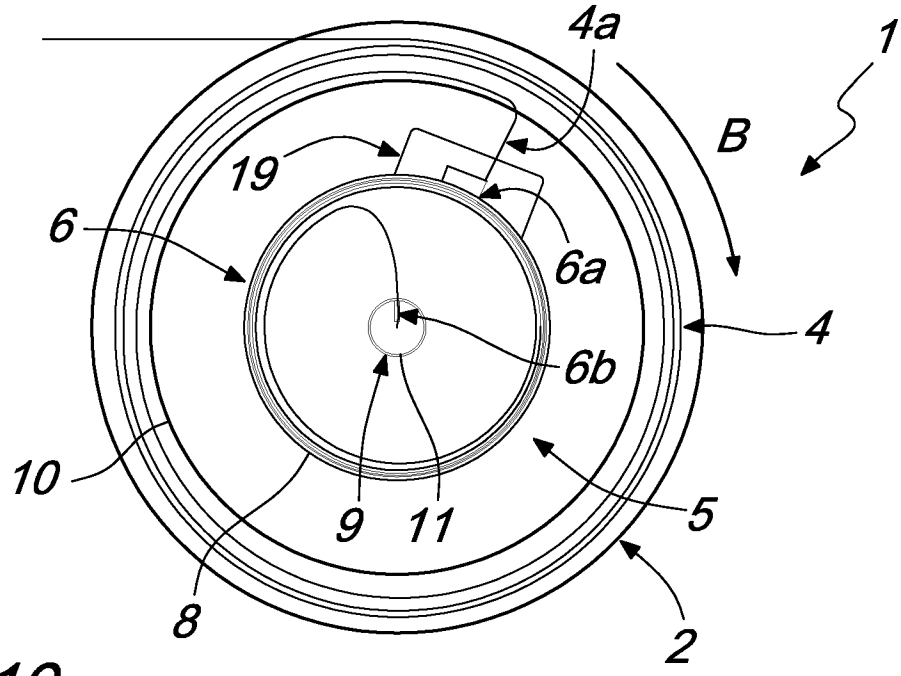

Fig. 10

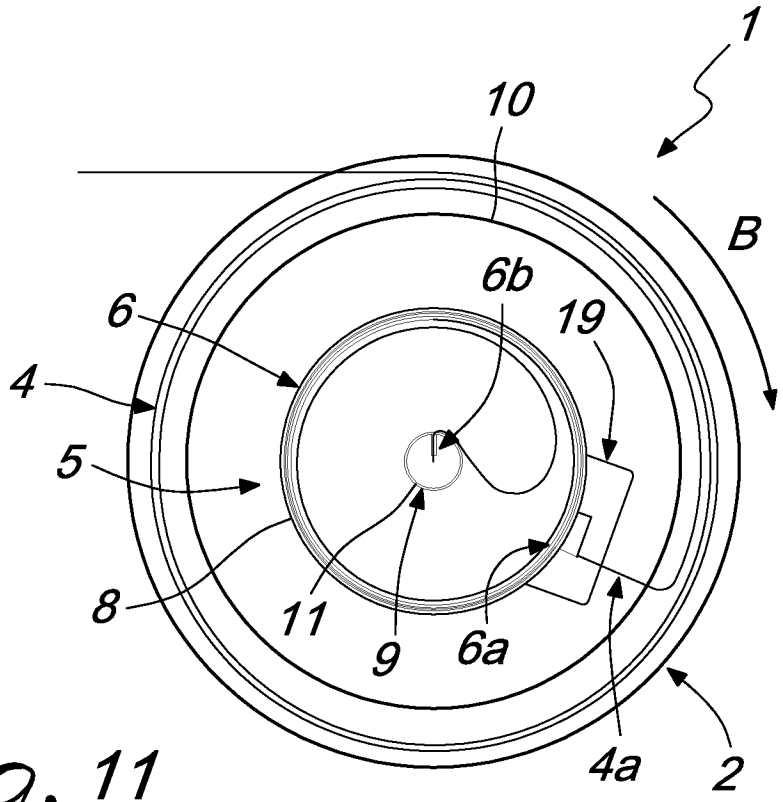

Fig. 11

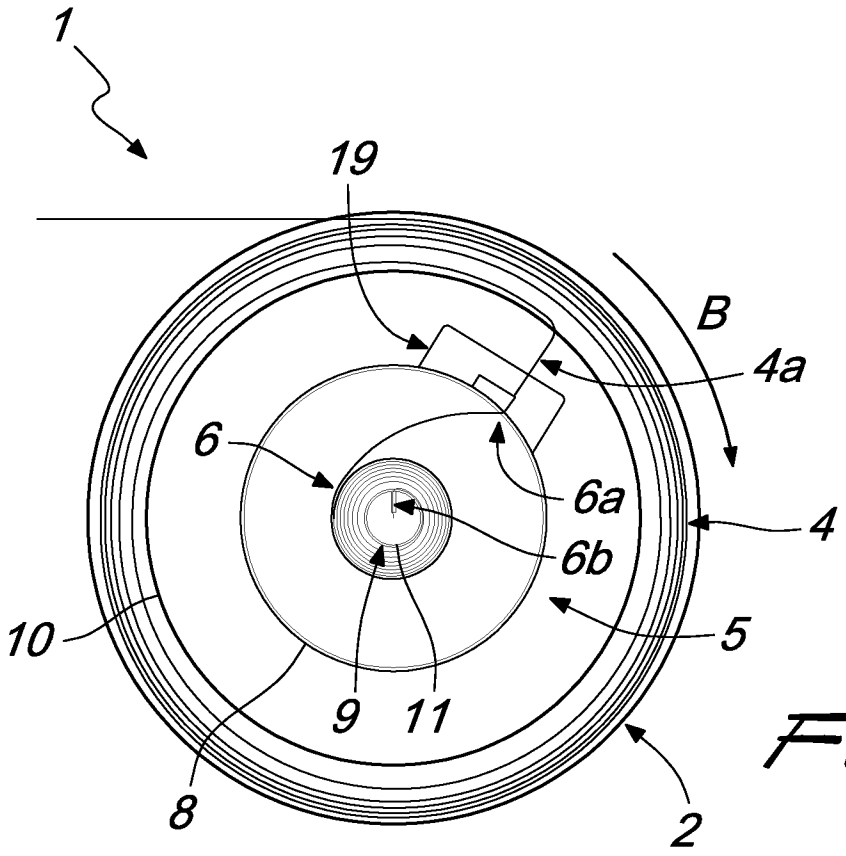

Fig. 12

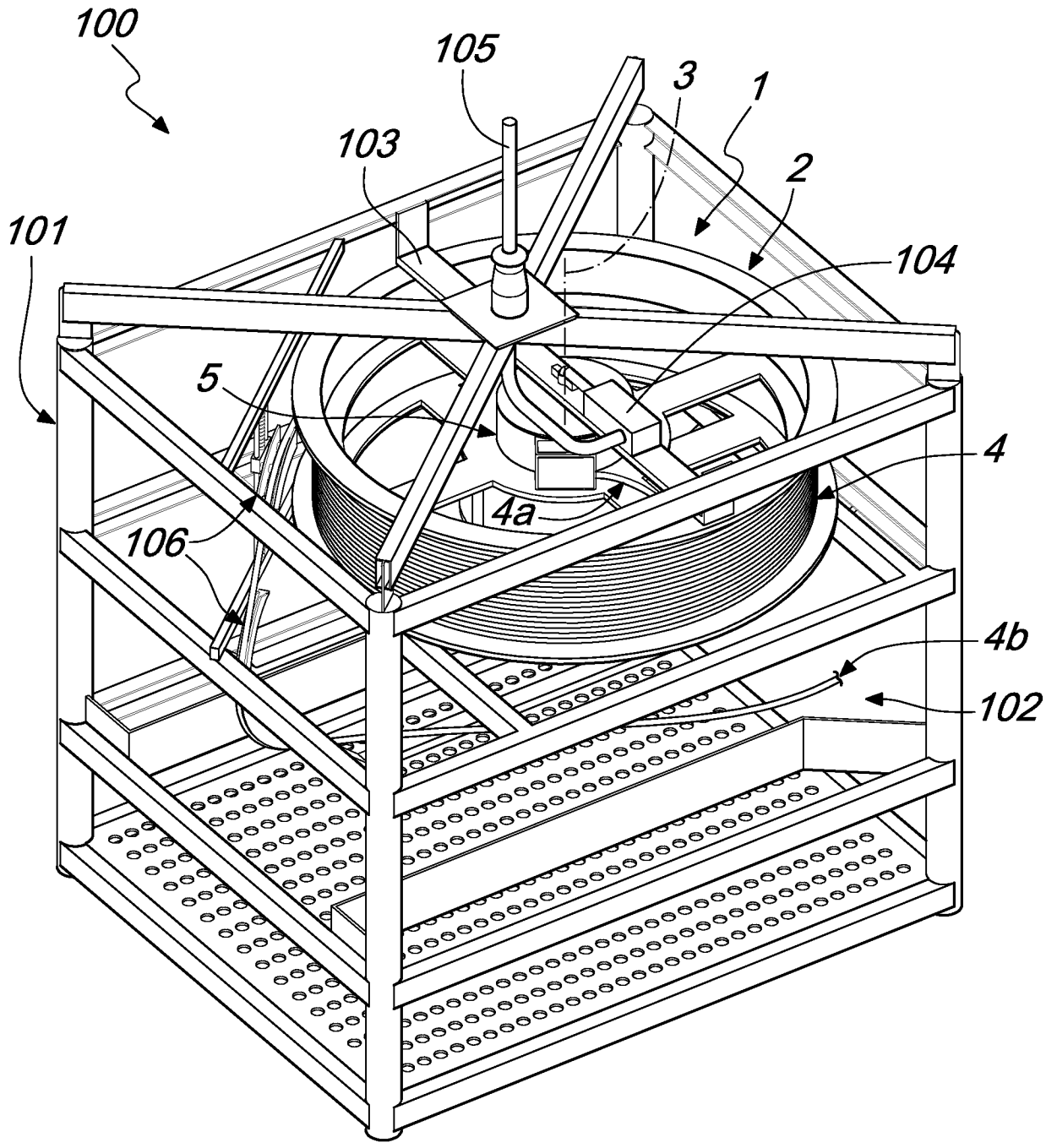

Fig. 13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2014/055164

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-10

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/055164

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65H75/44
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65H H02G B63G B63B B63C

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1 590 160 A (STANDARD TELEPHONES CABLES LTD) 28 May 1981 (1981-05-28)	1,3-8
A	the whole document	9

X	EP 2 455 319 A2 (TELEFONIX INC [US]) 23 May 2012 (2012-05-23) column 8, lines 15-27; figures 3,4	1,2,5,6, 10

X	US 2003/106823 A1 (LIAO SHENG HSIN [TW]) 12 June 2003 (2003-06-12) paragraph [0041]; figures 14,15	1,3-6

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 April 2014	16/07/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Pussemier, Bart

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2014/055164

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 1590160 A	28-05-1981	NONE	
EP 2455319 A2	23-05-2012	CN 102530656 A	04-07-2012
		EP 2455319 A2	23-05-2012
		US 2012126047 A1	24-05-2012
US 2003106823 A1	12-06-2003	CN 2563136 Y	30-07-2003
		US 2003106823 A1	12-06-2003

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-10

   A winding and unwinding device, particularly for power and/or signal transmission cables.

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2. claim: 11

   A temporary accommodation structure for remotely controlled user devices, comprising a base frame provided with seat for parking a remotely controlled user device.
