axis of rotation and about the second axis of rotation, so as to allow the tow cable to be wound onto the first drum during the first winding step during which the first drum is rotationally driven about the first axis, the second drum being able to be in an open state in which the second drum exhibits a receiving opening through which the towed body is able to pass in order to enter a volume surrounding the first drum and which is surrounded by the second drum, the winch being able to be in a coupled state in which the first drum and the second drum are coupled in terms of rotation about the second axis of rotation so as to allow the flexible elongate body to be wound about the second axis of rotation during a second winding step during which the second drum is rotationally driven about the second axis. The towed body may be capable of passing through the receiving opening during the first winding step or outside of this step.

[0025] Advantageously, the second drum is able to be in a receiving angular position, about the second axis with respect to the frame, in which position the tow cable and the towed body pass through the receiving opening during the first winding step.

[0026] Advantageously, the handling device is configured to implement the following step during a method of recovering the initially immersed sonar device and connected to the drum via the tow cable: the first winding step during which the first drum is rotationally driven about the first axis so that the tow cable is wound onto the first drum and so that the first hanger and the second hanger come to bear against the deflector to be deflected by the deflector so that the longitudinal axis of the towed body is oriented substantially parallel to the axis of the deflector, when the towed body is fully emerged and suspended from the first hanger and from the second hanger.

[0027] The invention also relates to the recovery method which comprises this step.

[0028] Advantageously, the handling device is configured to implement the first winding step until the towed body enters the volume delimited by the second drum through the receiving opening, and then a second winding step during which the second drum of the handling device, which is in the second state, is rotationally driven about the second axis of rotation so as to wind the flexible linear body onto the second drum.

[0099] In figures 1 to 4, the hangers 6 and 7 are fixed to the longitudinal ends of the elongate body. In other words, the fixing points 44 and 45 are situated at, which means to say a zero distance from, the respective longitudinal ends 42 and 43 along the longitudinal axis l. This embodiment limits the risks of the ends of the elongate body becoming jammed during recovery of the body.

[0100] In a less advantageous variant, at least one of the two fixing points 44, 45 is situated at a distance, along the longitudinal axis l, from the longitudinal end near which it is situated.

[0101] Advantageously, the distance separating the first fixing point 44 from the first longitudinal end 42 along the axis l is substantially the same as the distance separating the second fixing point 45 from the second longitudinal end 43 along the axis l. That makes it possible to encourage a vertical orientation of the longitudinal emitting antenna during towing. As a variant, these two distances are different, but this is less advantageous for the stability of the towed body during towing.

[0102] In figures 1 to 4, the length of the hangers 6 and 7 and the position of the deflector 60 are defined in such a way that the hangers 6 and 7 come to bear against the deflector, during the first winding step, when the towed body 4 is fully immersed or at least partially immersed, in a calm sea state, when the towing speed is below or equal to the maximum towing speed for recovery. This characteristic allows the towed body to be stabilized, namely makes it possible to begin to limit its freedom of movement, before it exits the water. This makes it possible to limit the movements of the elongate object as it exits the water, notably when the sea state is rough, compared with a situation in which the towed body 4 is emerged and suspended from the tow cable 2 while the tow cable 2 is still bearing on the deflector and deflected thereby. In the latter situation, an uncontrolled rotational movement of the longitudinal axis of the elongate body about the tow cable is brought about by a rough sea.

[0103] This is obtained through a suitable choice of the position of the deflector and of the length of the hangers according to the maximum towing speed.

[0104] As a variant, the length of the hangers 6 and 7 and the position of the deflector 60 are defined in such a way that the tow cable 2 bears against the deflector 60 and is deflected by the deflector 60 during the first winding step, when the towed body 4

[0153] The recovery method of the underwater device, initially deployed and connected to the drum 13 via the tow cable 2, comprises:

- a first winding step during which the winch 11 is in the uncoupled state, the first drum 13 being rotationally driven about the axis of rotation x1, with respect to the frame 12 so as to wind the tow cable 2 onto the first drum 13 (phases 1 and 2 of figure 9), the tow cable 2 passing through the receiving opening 15 or, in a less advantageous variant, through another opening formed in the second drum 14,

- a step of inserting the towed body 4 into the volume 140 (phase 3 of figure 9), through the receiving opening 15,

- a second winding step (phase 4 of figure 9) during which the winch 11 is in the coupled state, the second drum 14 being rotationally driven about the second axis of rotation x2 so that the flexible linear element 3 is wound onto the second drum 14.

[0154] In a first scenario, when the winch 11 is in the uncoupled state, the first drum 13 being rotationally driven about the axis of rotation x1, the tow cable 2 is wound onto the first drum 13 (phases 1 and 2 of figure 9) by passing through the receiving opening 15 and then the towed body 4 passes through the receiving opening 15, under the effect of the driving of the first drum 13 in rotation about the axis of rotation x1 (phase 3 of figure 9) to enter the volume 140 delimited by the second drum 14.

[0155] To this end, the second drum 14 is able to be positioned, and preferably immobilized, in what is referred to as a receiving angular position, about the axis x2, in which position the receiving opening 15 can have the tow cable 2 and the towed body 4 passed through it, during the first winding step. The receiving opening 15 therefore needs to be dimensioned such that the towed body can pass through it during the first winding step according to the orientation in which it arrives with respect to the opening.

[0156] Advantageously, if the first winding step continues, the towed body 4 comes to bear against the first drum 13, under the effect of the driving of the first drum 13 in rotation about the axis x1.

[0157] During the second winding step, the second drum 14 is rotationally driven about the axis x2 in the same sense of rotation as the sense of rotation of the first drum 13 during the first winding step.

deflector 160 forms, for example, part of the winch being, for example, positioned upstream of the first drum 13, for example upstream of the receiving opening 15 (during the first winding step), or at the receiving opening 15.

[0188] Different deflectors occupying different positions described hereinabove may, as a variant, be provided in the one same handling device.

[0189] It should be noted that the first drum 13 also constitutes a deflector allowing the towed body 4 to be brought substantially into the handling orientation on the first drum 13. In a variant which has not been depicted, the handling device comprises a single deflector formed by the first drum 13.

[0190] The invention relates to a method for recovering the sonar device from a surface ship comprising a first winding step during which the first drum 13 is rotationally driven about the first axis x1 so that the tow cable 2 is wound onto the first drum 13, and so that the first hanger 6 and the second hanger 7 come to bear on the deflector 60 to be deflected by the deflector so that the longitudinal axis of the towed body 4 is oriented substantially parallel to the axis of the deflector x, when the towed body 4 is fully emerged and suspended from the first hanger 6 and from the second hanger 7. The invention relates to a sonar system configured for implementing this step during a recovery method which is, for example, implemented when a recovery condition is met. The sonar system then comprises control means for controlling the handling device to implement the method.

[0191] The invention relates to a method for launching the sonar device from a surface ship comprising a first pay-out step during which the first drum 13 is rotationally driven about the first axis x1 so that the tow cable 2 is unwound off the first drum 13 and so that the first hanger 6 and the second hanger 7 come to bear on the deflector 60 to be deflected by the deflector so that the longitudinal axis of the towed body 4 is oriented substantially parallel to the axis of the deflector x, when the towed body 4 is fully emerged and suspended from the first hanger 6 and from the second hanger 7. The invention relates to a sonar system configured for implementing this step during a launch method which is implemented for example when a launch condition is met. The sonar system then comprises a control device for controlling the handling device to implement the method.

## CLAIMS

1. A sonar device intended to be towed by a surface ship and comprising a tow cable and a set of at least one towed device, comprising a towed body, intended to be towed by the surface ship via the tow cable , the towed body being elongate along a longitudinal axis from a first longitudinal end of the towed body as far as a second longitudinal end of the towed body, the towed body incorporating a first linear acoustic antenna comprising a plurality of electroacoustic transducers substantially aligned along the longitudinal axis, the towed device being configured and connected to the tow cable in such a way that the towed body is able, when it is being towed and is fully submerged, to exhibit an orientation in which the longitudinal axis extends substantially along a vertical axis defined by the force of gravity, at least one towed body of the set of at least one towed device being connected to the tow cable by a first hanger and a second hanger of substantially the same length, a first end of the first hanger and a first end of the second hanger being connected to the tow cable and a second end of the first hanger being attached to the towed body at a fixing point of the towed body, which point is situated near the first longitudinal end, and a second end of the second hanger being attached to the towed body at a second fixing point secured to the first fixing point and situated near the second longitudinal end.

2. The sonar device as claimed in claim 1, wherein the first hanger and the second hanger each have a fixed length.

3. The sonar device according to either one of the preceding claims, wherein the second end of the first hanger is attached to the first longitudinal end of the towed body and the second end of the second hanger is attached to the second longitudinal end of the towed body.

4. The sonar device as claimed in any one of the preceding claims, comprising a flexible elongate body of substantially neutral buoyancy intended

to be towed by the tow cable and comprising a second acoustic antenna comprising a plurality of electroacoustic transducers distributed along the flexible elongate body, the flexible elongate body being connected to the tow cable via the set of at least one towed body, the towed body being connected to the flexible elongate body in such a way that the flexible elongate body applies traction to the towed body at a third fixing point situated near the first longitudinal end of the towed body and a fourth fixing point situated near the second longitudinal end of the towed body.

5. The sonar device as claimed in the preceding claim, wherein at least one towed body of the set of at least one towed body is connected to the flexible elongate towed body by a third hanger and a fourth hanger, a first end of the third hanger being attached to the towed body at a third fixing point situated near the first longitudinal end of the towed body and a first end of the fourth hanger being attached to the towed body at a fourth fixing point situated near the second longitudinal end of the towed body.

6. The sonar device as claimed in the preceding claim, wherein the set of at least one towed body comprises a single towed body or a plurality of towed bodies.

7. The sonar device as claimed in the preceding claim, wherein the set of at least one towed body comprises a plurality of towed bodies, the sonar device comprising at least one line joining together two towed bodies of the set and comprising at least one electroacoustic transducer.

8. The sonar device as claimed in any one of the preceding claims, wherein the towed device is the towed body.

9. A sonar system comprising a sonar device as claimed in any one of the preceding claims and a handling device intended for launching and recovering the sonar device from the surface ship, the handling device comprising a winch

comprising a first drum able to rotate about a first axis of rotation to wind the tow cable onto the first drum.

10. The sonar system as claimed in the preceding claim, wherein the handling device comprises a set of at least one convex deflector having the overall shape of a portion of a cylinder extending longitudinally along an axis of the deflector, the deflector being arranged in such a way as to extend substantially horizontally, in a calm sea state, and substantially perpendicular to a vertical plane substantially parallel to an axis of the traction applied to the tow cable by the handling device during a first step of winding during which the first drum is rotationally driven about the first axis so that the tow cable is wound onto the first drum and so that the first hanger and the second hanger come to bear against the deflector so as to be deflected by the deflector so that the longitudinal axis of the towed body is oriented substantially parallel to the axis of the deflector when the towed body is fully emerged and suspended from the first hanger and from the second hanger.

11. The sonar system as claimed in the preceding claim, wherein the axis of at least one deflector of the set is substantially parallel to the first axis of rotation.

12. The sonar system as claimed in either one of claims 10 and 11, wherein at least one deflector of the set of at least one deflector is arranged in such a way that, during the first winding step, the first hanger and the second hanger are able to come to bear against the deflector, when the towed body is fully immersed.

13. The sonar system as claimed in any one of claims 10 to 12, wherein the set of at least one deflector comprises at least one deflector arranged upstream of the first drum, viewed from the first hanger and from the second hanger initially immersed, during the first winding step.

14. The sonar system as claimed in any one of claims 9 to 13, wherein the winch comprises a set of at least a second drum surrounding the first drum and able to rotate with respect to a frame of the winch about a second axis of rotation substantially parallel to the first axis of rotation, the winch being able to be in an uncoupled state in which the first drum and the second drum are uncoupled in terms of rotation about the first axis of rotation and about the second axis of rotation, so as to allow the tow cable to be wound onto the first drum during the first winding step during which the first drum is rotationally driven about the first axis, the second drum being able to be in an open state in which the second drum exhibits a receiving opening through which the towed body is able to pass during the first winding step in order to enter a volume surrounding the first drum and which is surrounded by the second drum, the winch being able to be in a coupled state in which the first drum and the second drum are coupled in terms of rotation about the second axis of rotation so as to allow the flexible elongate body to be wound about the second axis of rotation during a second winding step during which the second drum is rotationally driven about the second axis.

15. The sonar system as claimed in the preceding claim, wherein the second drum is able to be in a receiving angular position, about the second axis with respect to the frame, in which position the tow cable and the towed body pass through the receiving opening during the first winding step.

16. The sonar system as claimed in any one of claims 9 to 15, wherein the handling device is configured to implement the following step during a method of recovering the initially immersed sonar device: the first winding step during which the first drum is rotationally driven about the first axis so that the tow cable is wound onto the first drum and so that the first hanger and the second hanger come to bear against the deflector to be deflected by the deflector so that the longitudinal axis of the towed body is oriented substantially parallel to the axis of the deflector, when the towed body is fully emerged and suspended from the first hanger and from the second hanger.

17. The sonar system as claimed in the preceding claim insofar as that is dependent on claim 15, wherein the handling device is configured to implement the first winding step until the towed body enters the volume delimited by the second drum through the receiving opening, and then a second winding step during which the second drum of the handling device, which is in the second state, is rotationally driven about the second axis of rotation so as to wind the flexible linear body onto the second drum.