

**Device for launching and recovering a submersible
or surface craft.**

5 The present invention concerns the field of
handling submarine or marine craft, and in
particular a device for launching and recovering
such a craft.

10 A particularly beneficial application of the
invention concerns launching and recovering a
submersible craft connected to a traction cable.

15 The operations of launching and recovering a
submarine or marine craft carried out from a naval
surface vehicle may be rendered difficult by
longitudinal swaying and rolling movements of the
naval vehicle.

20 For deploying and recovering a submarine or
marine craft it is conventional to use a lifting
ring fixed to the upper face of the craft and
winch means provided on the naval vehicle.

 Hooking the lifting ring onto the winch means
may be particularly difficult to carry out.

25 Moreover, such a craft generally includes
fragile external equipment, for example propulsion
units, vision system video cameras or measurement
sensors.

30 Now, during launching and recovery phases,
relative movements between the submarine or marine
craft and the naval surface vehicle may cause
damage to this external equipment.

 The present invention aims to remedy these
drawbacks.

 The present invention aims more particularly
to provide a device for launching and recovering a

submersible or surface craft that is adapted to handle craft including fragile external equipment.

The present invention further aims to provide a device enabling the operations of recovering and launching the craft to be carried out easily, safely and accurately.

In one embodiment, the device for launching and recovering a submersible or surface craft comprises means for suspending the craft, a clamp mounted on the suspension means and comprising two mobile arms rotatable between an open position and a closed position for holding the craft, and docking means rotatably mounted on the suspension means and adapted to receive one end of the craft so as to enable alignment of the craft with said docking means.

The docking means advantageously have a conical general shape. The docking means may comprise an opening for a cable connected to the craft to pass through.

In one embodiment, the suspension means comprise a main support beam and two suspension columns extending downward from said suspension beam and carrying the clamp.

The clamp is preferably mobile relative to the main support beam between a lowered holding position and a raised position. The suspension means may comprise an upper support bar mounted on the main beam, a pulley mounted on the support bar, a suspension cable wound onto the pulley and fixed at one of its ends to the clamp, and an actuator connected to said cable and adapted to enable disengagement of the arms of the clamp in the raised position in which the craft is released.

The suspension means may further comprise a lower support bar carrying the clamp and a stiffener spacer extending transversely between the lower and upper support bars, one end of said
5 spacer being rotatably mounted on the associated support bar.

The docking means are advantageously rotatably mounted on the lower support bar. The suspension columns are preferably deformable.

10 In one embodiment, the arms of the clamp form, in the closed holding position, a cage for holding the craft in position. The ends of the arms of the clamp may comprise contact surfaces adapted to come to bear against a lower face of
15 the craft. The arms are preferably provided with rotatable rollers that comprise the surfaces that contact the lower face of the craft. The clamp advantageously comprises an actuator adapted to enable movement of the arms between the open
20 position and the closed holding position. The clamp may comprise means for detecting the presence of the craft.

The invention also concerns a system for launching and recovering a submersible or surface
25 craft comprising a chassis adapted to be fixed to a naval surface vehicle, two arms mounted on the chassis to rotate about a first rotation axis and mobile between a stowed position of the craft and a launching or recovery position, and a launching
30 and recovery device as defined hereinabove mounted on the arms to rotate about a second rotation axis parallel to said first rotation axis.

In one embodiment, the system comprises means for winding in and paying out cable adapted to
35 wind in a cable connected to the craft to draw

said craft into the interior of the docking means of the device during a recovery phase.

The system advantageously comprises damping means mounted between the device and the arms.

5 In one embodiment, the system comprises a cap adapted to be fixed to the rear or front part of the craft and configured to cooperate with the docking means of the device.

10 The present invention will be better understood after reading the detailed description of one embodiment given by way of nonlimiting example and illustrated by the appended drawings, in which:

15 - Figure 1 is a perspective view of a system of the invention for launching and recovering a craft,

 - Figures 2 and 3 are diagrammatic views of a naval surface vessel on which the system from Figure 1 is mounted, and

20 - Figures 4 to 8 are perspective views of a launching and recovery device of the system from Figure 1 during a phase of launching the craft.

 In Figures 1 to 3 there is represented a system 10 adapted to launch and recover a craft 12 and mounted on a vessel or a naval surface vehicle 14. The system 10 in particular enables the craft 12 to be moved between a stowed position shown in Figures 1 and 2 and a launching position shown in Figure 3.

30 The craft 12 may for example be a floating or submersible submarine vehicle designed to carry out submarine surveillance and/or inspection. In the embodiment shown, the craft 12 is a submersible vehicle wire-guided via a cable 16
35 connected to said craft as shown by way of example

in Figures 4 to 8. The cable 16 may advantageously be the optical fibre of the craft 12 that is used in particular to transport communications between the craft and a control station that may or may not be situated on the naval vehicle 14.

The craft 12 is shown more clearly in Figure 4. In that figure, the craft is represented in dashed outline. The craft 12 extends along a longitudinal axis 18 and comprises a main body 20 of cylindrical general shape. The body 20 is provided with control surfaces 20 fixed to a rear end and adapted to stabilize the movement of the craft and longitudinal propulsion units 24 fixed to either side of the body forward of the control surfaces. The craft 12 also comprises a front part 26 supported by two lateral arms 28 of the body 20 and rotatable about an axis transverse to the axis 18. The front part 26 may for example comprise a video camera 30 for observation of the sea bed. For more details on submersible craft of this type see for example the patent application WO 2006/035121 of the applicant.

Referring again to Figures 1 to 3, the system 10 is provided with a chassis 32 fixed via four damper feet 34 to the naval vehicle 14, two identical parallel arms 36 mounted on the chassis to rotate about a horizontal axis 38, a launching and recovery device 40 mounted at the free end of the arms 36 to rotate about a horizontal axis 42 parallel to said axis 38, and means 43 for winding in and paying out the cable 16 fixed to the chassis 32. The axes 38 and 42 are perpendicular to a vertical median plane of the craft containing the axis 18 of said craft in the stowed, launching and recovery positions of said craft.

The chassis 32, of rectangular general shape, delimits a first housing 44 inside which the winding in and paying out means 43 are mounted, and an adjacent second housing 46 inside which the
5 craft 12 is partially situated in the stowed position. On the side opposite the housing 44, the chassis 32 comprises two arms 48, 50 extending obliquely upward and on the free end of which are rotatably mounted the arms 36 supporting the
10 device 40. An articulation shaft 52 on the axis 38 extends transversely between the arms 48, 50 and supports the arms 36 and pulleys 54, 56. Said arms and the pulleys are rotationally connected to the articulation shaft 52. Onto each of the pulleys
15 54, 56 is wound a cable 58, 60. An actuator 62, 64 fixed to the chassis 32 cooperates with each cable 58, 60 to drive in rotation the pulleys 54 and 56, the articulation shaft 52 and the arms 36, and thus to enable rotation relative to the shaft 52
20 of the craft 12 from its stowed position toward the launching position and from the recovery position toward said stowed position. The size of the arms 36, 48 and 50 and the range of angular pivoting movement of the arms 36 are chosen as a
25 function of the height between the surface S of the water and the surface of the naval vehicle 14 to which the chassis 32 is fixed. By way of illustration, in the embodiment shown, the angle formed on the one hand by the arms 48, 50 and on
30 the other hand by the arms 36 is equal to 45° in the stowed position of the craft 12 and equal to 225° in the launching position.

In order to damp longitudinal front to back swaying movement of the craft 12 carried by the
35 device 40, the system 10 comprises a damper

piston-and-cylinder actuator 66 disposed between each arm 36 and a link 68 mounted on the device 40 carrying the craft 12.

5 As shown more clearly in Figure 4, the device 40 comprises suspension means 70, a clamp 71 carried by the suspension means and adapted to enable holding of the craft 12 in order to lift it and move it, and docking means 72 adapted to receive a rear part of the craft. In Figure 4, the device 40 is represented during an initial step of the phase of launching the craft 12 that equally corresponds to a final step of the phase of recovering the craft.

10 The suspension means 70 comprise a horizontal main support beam 73, two suspension columns 74, 76 extending vertically downward, and an upper support bar 78 carrying the clamp 71. The beam 73, on the axis 42, extends transversely between the arms 36 (Figures 1 to 3) and is mounted to rotate freely on said arms. The beam 73 enables rotatable mounting of the device 40 on the arms 36 of the chassis. To each end of the beam 73 is fixed the link 68 enabling the device 40 to be connected to the damper piston-and-cylinder actuator 66 fixed to the associated arm 36.

25 The suspension columns 74, 76 are identical and symmetrical with respect to a vertical median plane of the device 40 passing through the bar 78 and containing the longitudinal axis 18 of the craft 12. In the position of the craft 12 shown in Figure 4, the vertical median plane of the device coincides with the median plane of the craft. For clarity, only the suspension column 74 is described hereinafter. The column 74 is attached to the beam 73 in the vicinity of one of its ends

by means of a fixing plate 80. The column 74 comprises, at its lower end, a mounting plate 82 carrying the clamp 71. The column 74 is constituted of a plurality of cylinders 84 partially nested inside each other and stacked vertically between the plates 80 and 82, and a suspension cable 86 extending inside the cylinders. The cylinders 84 form a sheath for guiding the cable 86. The top cylinder 84 of the stack is fixed to the plate 80, the bottom cylinder 84 of said stack being fixed to the plate 82. The cylinders 84 may be slightly articulated relative to each other to enable deformation of the columns 74, 76 so that said columns may assume different curvatures. The suspension columns 74, 76 are deformable. The upper end of the cable 86 is fixed to the plate 80 and the lower end is fixed to a shaft 88 mounted on the clamp 71 and situated in the vertical median plane of the device 40. A pulley (not visible) is provided at the level of the plate 82 to guide the cable 86 toward the shaft 88.

The support bar 78 extends longitudinally and transversely relative to the beam 73, being situated substantially halfway between the suspension columns 74, 76. The bar 78 comprises at its front end a pulley 92 mounted to rotate about a horizontal axis and onto which is wound a metal suspension cable 94 the lower end of which is fixed to the shaft 88 of the clamp 71. The upper end of the cable 94 is connected to an actuator 96, for example a piston-and-cylinder actuator, fixed to the bar 78 and adapted to apply a traction force to said cable to incline part of the device 40.

The suspension means 70 also comprise a horizontal lower support bar 98 and a stiffener spacer 100 extending vertically between the support bars 78, 98. The bar 98 is disposed in the vertical median plane of the device 40 and situated slightly above the upper face of the craft 12 in a lowered holding position of the clamp 71 as shown in Figure 4. The upper end of the spacer 100 is fixed to a rear end of the support bar 78, its lower end being mounted on the support bar 98 to rotate about a horizontal axis 102 parallel to the axis 42. The bar 98 comprises at its front end a plate 103 carrying the clamp 71.

The clamp 71 comprises two arms 104, 106 mobile between a closed position and an open position. The arms 104, 106 are identical and symmetrical with respect to the vertical median plane of the device 40 passing through the bars 78, 98 and the shaft 88. For reasons of clarity, only the arm 104 is described hereinafter. The arm 104 comprises two plates 108, 110 spaced longitudinally from each other and held apart by spacers 112 extending transversely between them. The plates 108, 110 are identical and generally L-shaped. Each plate 108, 110 comprises a first portion 108a, 110a extending vertically and facing one of the lateral faces of the craft 12 that is extended at a lower end by a second portion 108b, 110b bent inward and situated under the lower face of the craft. The plates 108, 110 of the arm 104 are rotatably mounted at the upper end of the portions 108a, 110a, on an articulation rod 114 extending longitudinally and bolted to the mounting plate 82. The arm 104 is mobile about a

longitudinal axis 116 of said rod that is parallel to the axis 18 of the craft 12 in the position of the craft shown in Figure 4.

5 The arm 104 comprises a first roller 118 extending longitudinally between the bent second portions 108b, 110b of the plates and mounted to rotate about an axis parallel to the axis 116. The arm 104 also comprises second and third rollers 120, 122 respectively mounted on the second
10 portions 108b, 110b of the plates in the vicinity of the first roller 114. The rollers 120, 122 are rotatable about a common rotation axis parallel to the rotation axis of the roller 118. The rollers 114 to 118 are advantageously made from or covered
15 with a damping material, for example polyurethane, so as not to damage the lower face of the submersible craft 12 on contact with said craft. To this end, strips 124, 126 of damping material are also provided to cover the areas of the first
20 portions 108a, 110b of the plates 108, 110b coming into contact with the lateral face of the craft.

The clamp 71 further comprises a plate 128 extending transversely between the arms 104, 106 and fixed to the front plates of said arms in the
25 vicinity of their upper end. The plate 128 supports the shaft 88. The plate 103 of the support bar 98 is fixed to the rear plates of the arms 104, 106.

To move the arms 104 and 106, the clamp 71
30 comprises a piston-and-cylinder actuator 130 provided with a body 131 fixed to the articulation rod 114 of the arm 104 between the plates 108 and 110 and a piston 132 sliding relative to said body and the free end of which is fixed to the
35 articulation rod of the arm 106. The piston-and-

cylinder actuator 130 enables the arms 104, 106 to be moved between a closed holding position shown in Figure 4 in which said arms delimit a cage for immobilizing and holding the craft 12 and a spread
5 apart or open position shown in Figure 5 in which the arms 104, 106 are situated at a distance from the craft 12.

As shown more clearly in Figure 6, the clamp 71 further comprises means 134 for detecting the
10 presence of the craft comprising two arms 136, 138 rotatably mounted on the shaft 88 and each provided at its free end with a roller 140, 142 mounted to rotate freely about an axis parallel to the rotation axis of the rollers 118, 120 and 122.
15 The metal, for example steel, arms 136, 138 extend downward so as to be situated in part vertically beneath the plate 128. The rollers 140, 142 comprise a contact surface adapted to come to bear against the upper face of the craft 12. On contact
20 between the rollers 140, 142 and the craft, the arms 136, 138 pivot upward in the direction of the plate 128.

The detection means 134 also comprise an inductive sensor 144 fixed to the clamp 71,
25 disposed vertically beneath the plate 128 and offset toward the rear relative to the free end of the arms 136, 138 supporting the rollers 140, 142. The inductive sensor 144 emits an electromagnetic field and is adapted to detect any variation of
30 the value of this field occurring on upward movement of the arms 136, 138 caused by contact of the rollers 140, 142 with the upper face of the craft 12. Thus the presence of the craft 12 may be detected.

Referring again to Figure 4, the lower support bar 98 comprises, at its rear end, two rods 146, 148 extending vertically downward and at the lower end of which are rotatably mounted the docking means 72. The docking means 72 are mounted to rotate freely about an axis 150 parallel to the rotation axis 42 of the device 40. The axis 150 is perpendicular to the vertical median plane of the device 40 containing the axis 18 of the craft in the position shown in Figure 4.

The docking means 72 comprise a mounting base 152 rotatably mounted on the rods 146, 148 and a collector or receiver member 154 fastened to said base. The receiver member 154 extends along a longitudinal axis 156 angularly aligned with the longitudinal axis 18 of the craft 12 in the position of said craft shown in Figure 4. In this position, the axes 18 and 156 are parallel to the rotation or articulation axis 116 of the arms 104, 106.

The receiver member 154 comprises a main part 158 extending between the rods 146, 148 and extended at its front end by an annular centring ring 160 and at its rear end by an outwardly flared annular guide flange 162. The ring 160 and the flange 162 are disposed axially on either side of the rods 146 and 148, with respect to the axis 156, and form stops for limiting the rotational movement of the docking means 72. By way of illustration, relative to the position shown in Figure 4 in which the axis 156 is horizontal and aligned with the axis 18 of the craft, angular swaying toward the rear of the docking means 72 until the ring 160 abuts against the rods 146, 148 is of the order of 5° and swaying toward the front

of said docking means until the flange 162 abuts against said rods is of the order of 15° .

5 In the embodiment shown, the main part 158 has a frustoconical general shape the section of which decreases progressively between the ring 160 and the flange 162. The main part 158 has a hollow
10 general shape and delimits a through-passage or opening. The opening enables reception of a cap 164 fixed to the rear end of the craft 12 to dock and moor said craft. The ring 160 facilitates penetration and centring of the cap 164 in the docking means 72. The opening in the receiver member 154 also provides a passage for the cable 16 connected to the craft. At the exit from the
15 docking means 72, the cable 16 is guided by the flange 162 and by a pulley 166 fixed to the rods 146, 148 above said flange 162, extending along an axis parallel to the axis 42.

20 The cap 164 of the craft 12 comprises a base fixed, for example bolted, to the rear part of the craft 12 and a nose extending said base. The nose extends along the longitudinal axis 18 of the craft and has a conical general shape. The nose of the cap 164 is adapted to penetrate into and to be
25 accommodated in the interior of the receiver member 154. To prevent the cap 164 jamming inside the receiver member 154, the cone angles of the main part 158 and the nose of the cap 164 are different. The cap 164 may advantageously be
30 produced by assembling two identical parts and made from a synthetic material, for example polyamide (PO). The cap 164 also enables improvement of the flow of water along the craft 12 when it is moving and reduction of its drag.

The operation of the launching and recovery system 10 is described in detail next.

5 The method of launching the craft 12 from the naval surface vehicle 14 is as follows. In a first step, actuation of the piston-and-cylinder actuators 62, 64 is commanded to drive the pulleys 54, 56 and to rotate the arms 36 about the rotation axis 38 relative to the chassis 32. The piston-and-cylinder actuators 62, 64 are actuated
10 to move the craft 12 from the stowed position on the chassis 32 as shown in Figures 1 and 2 toward the launching position of the craft in which the craft 12 is entirely immersed, as shown in Figure 3. During movement of the craft 12 from the stowed
15 position toward the launching position, the piston-and-cylinder actuators 66 enable limitation of front to rear rotation movements of the device 40 about the axis 42 so as to hold the craft 12 in a substantially horizontal position.

20 The launching position of the craft 12 is shown more clearly in Figure 4. In this position, the cap 164 is accommodated in the docking means 72 of the device 40, the longitudinal axis 156 of the receiver member 154 of said docking means
25 being aligned with the axis 18 of the craft. The arms 104, 106 of the clamp 71 are in the closed holding position in which the rollers 118, 120 and 122 bear against the lower face of the craft 12 and the strips 124, 126 bear against the lateral
30 faces of said craft longitudinally between the propulsion units 24 and the front part 26. The rollers 118 of the arms come to bear one against the other so that the arms 104, 106 delimit a closed cage.

In a second step, starting from this immersed position of the craft 12, actuation of the piston-and-cylinder actuator 130 is commanded to rotate the arms 104, 106 about the articulation axes 116 and to bring about the movement from the closed holding position to the open position shown in Figure 5. In this open position of the clamp 71, the plates 108, 110 and the rollers 118 to 122 of the arms are situated at a distance from the craft 12 and sufficiently far away therefrom to prevent any contact between these members. As shown in this figure, the rotation of the arms 104, 106 causes pivoting of the plates 82 and slight deformation of the suspension columns 74, 76.

In a third step, the actuator 96 is commanded to exert a traction force on the suspension cable 94 and to move the clamp 71 toward the support bar 78 as shown in Figures 6 and 7. This movement of the clamp 71 from the lowered holding position to a raised position causes slight downward movement of the docking means 72 in the water, which is simultaneously compensated by commanding actuation of the piston-and-cylinder actuators 62, 64 to produce slight upward pivoting of the arms 36, of the order of 5 to 10°.

On movement of the clamp 71 from the low position to the high position, the lower end of the spacer 100 pivots about the axis 102 and the rods 146, 148 pivot about the axis 150. During this movement, there also occur pivoting of the plates 82 and greater deformation of the suspension columns 74, 76. In the raised position of the clamp 71 as shown in Figures 6 and 7, the flange 162 of the receiver member 154 comes to abut against the rods 146, 148 and the support bar

98 extends obliquely upward. In this raised position, the lower ends of the arms 104, 106 and the rollers 118 are situated vertically above the craft 12. Accordingly, on subsequent movement of the craft, there is no contact between on the one hand the clamp 71 and the suspension means 70 of the device 40 and on the other hand the craft, in particular at the level of the control surfaces 20 and the propulsion units 24.

In a final step, the propulsion units 24 of the craft 12 are started so that the craft 12 is detached from and moves away from the docking means 72, as shown in Figure 8. The engine 12 may then perform the planned inspection and/or surveillance mission. During movement of the craft 12 toward the area to be inspected, the receiver member 154 forms means for guiding the cable 16.

The method of recovering the craft 12 is described next. In a first step, the stopping of the propulsion units 24 of the craft is commanded as well as actuation of the piston-and-cylinder actuators 62, 64 to enable upward rotation of the arms 36 of the chassis so that the docking means 72 are situated substantially at the surface of the water. By way of indication, in the embodiment shown, the angle formed on the one hand by the arms 48, 50 and on the other hand by the arms 36 is of the order of 195° in the position for recovering the craft 12.

In a second step, actuation of the means 43 is commanded to wind in the cable 16 and to bring the cap 164 of the craft 12 into the vicinity of the docking means 72 of the device 40 in a position corresponding to that of Figure 8. As indicated above, in this position, the clamp 71 is

in the raised position and the flange 162 of the receiver member 154 is abutted against the rods 146, 148.

5 In a third step, stopping of the means 43 is commanded to enable the craft 12 to surface because of its own buoyancy. Then, in a fourth step, actuation of the means 43 is commanded again to enable docking of the craft 12 in the interior of the receiver member 154 thanks to introduction
10 of the cap 164 of the craft into said member. After docking, the craft 12 and the device 40 are in the position corresponding to that described above with reference to Figures 6 and 7, the axis 18 of the craft and the axis 156 of the receiver
15 member being aligned.

During this fourth step, if the longitudinal axis 18 of the craft 12 is not aligned with the axis 156 of the receiver member 154 when introduction of the cap 164 begins, said receiver
20 member may be tilted about the rotation axis 150 by the forces exerted by the cap 164. During introduction of the craft 12 into the receiver member 154, there is therefore obtained under these conditions auto-alignment of the axis 156 of
25 the docking means 72 and the longitudinal axis 18 of the craft.

In a fifth step, after alignment of the axis 18 of the craft 12 with the axis 156 of the receiver member 154, the actuator 96 is commanded
30 to allow the clamp 71 to descend toward the lowered holding position corresponding to the position shown in Figure 5. After the inductive sensor 144 detects the presence of the craft 12, actuation of the piston-and-cylinder actuator 130
35 is commanded to rotate the arms 104, 106 from the

open position toward the closed holding position. Once the craft 12 is held by the clamp 71, the suspension columns 74, 76, because of the weight of the craft, enable limitation of roll phenomena at the level of the clamp 71.

Finally, in a last step, actuation of the piston-and-cylinder actuators 62, 64 is commanded to allow the craft 12 to be moved from the recovery position to the stowed position at the level of the chassis 32 mounted on the naval vehicle 14. If the naval vehicle 14 is a remote-controlled surface vehicle that is controlled remotely by an operator, the system 10 comprises a video camera in order to view the penetration of the cap 164 of the craft at the level of the docking means 72 during the recovery phase.

In the embodiment shown, the craft is equipped at its rear end with a cap adapted to cooperate with the docking means. Clearly it would be equally possible, without departing from the scope of the invention, to provide for the docking means of the launching and recovery device to cooperate with the rear end or the front end of the associated craft directly, i.e. with no attached cap.

Thanks to the invention, during a phase of recovering the craft, the introduction of the craft into the docking means enables alignment of the axis of the craft with the axis of said docking means. Thus it is possible to ensure that, in the holding position of the clamp, the articulation axis of the arms is parallel to the longitudinal axis of the craft and that the clamp is centred on said longitudinal axis so as to hold the craft properly.

CLAIMS

1. Device for launching and recovering a submersible or surface craft, characterized in that it comprises:

- 5 - means (70) for suspending the craft,
 - a clamp (71) mounted on the suspension means and comprising two arms (104, 106) rotatable between an open position and a closed position holding the craft, and
- 10 - docking means (72) rotatably mounted on the suspension means and adapted to receive one end of the craft so as to enable alignment of the craft with said docking means.

2. Device according to Claim 1, wherein the
15 docking means (72) have a conical general shape.

3. Device according to Claim 1 or Claim 2, wherein the docking means (72) comprise an opening for a cable connected to the craft to pass through.

20 4. Device according to any one of the preceding claims, wherein the suspension means comprise a main support beam (73) and two suspension columns (74, 76) extending downward from said suspension beam and carrying the clamp
25 (71).

5. Device according to Claim 4, wherein the clamp (71) is mobile relative to the main support beam (73) between a lowered holding position and a raised position.

30 6. Device according to Claim 5, wherein the suspension means comprise an upper support bar (78) mounted on the main beam, a pulley (92) mounted on the support bar, a suspension cable

(94) wound onto the pulley and fixed at one of its ends to the clamp, and an actuator (96) connected to said cable and adapted to allow movement of the arms between the lowered holding position and the raised position.

7. Device according to Claim 6, wherein the suspension means further comprise a lower support bar (98) carrying the clamp and a stiffener spacer (100) extending transversely between the lower and upper support bars, one end of said spacer being rotatably mounted on the associated support bar.

8. Device according to Claim 7, wherein the docking means (72) are rotatably mounted on the lower support bar (98).

9. Device according to any one of Claims 4 to 8, wherein the suspension columns (74, 76) are deformable.

10. Device according to any one of the preceding claims, wherein, in the closed holding position, the arms (104, 106) of the clamp form a cage for holding the craft in position.

11. Device according to any one of the preceding claims, wherein the ends of the arms (104, 106) of the clamp comprise contact surfaces adapted to bear against a lower face of the craft.

12. Device according to Claim 11, wherein the arms are provided with rollers (118, 120, 122) that are rotatable and comprise the surfaces that contact the lower face of the craft.

13. Device according to any one of the preceding claims, wherein the clamp (71) comprises an actuator (130) adapted to enable movement of the arms between the open position and the closed holding position.

14. Device according to any one of the preceding claims, wherein the clamp (71) comprises means (134) for detecting the presence of the craft.

5 15. System for launching and recovering a submersible or surface craft comprising a chassis (32) adapted to be fixed to a naval surface vehicle, two arms (36) mounted on the chassis to rotate about a first rotation axis (38) and mobile
10 between a stowed position of the craft and a launching or recovery position, and a device (40) according to any one of the preceding claims mounted on the arms to rotate about a second rotation axis (42) parallel to said first rotation
15 axis.

 16. System according to Claim 15, comprising means (43) for winding in and paying out cable adapted to wind in a cable (16) connected to the craft to draw said craft into the
20 interior of the docking means (72) of the device (40) during a recovery phase.

 17. System according to Claim 15 or Claim 16, comprising damping means (66) mounted between the device (40) and the arms (36).

25 18. System according to any one of Claims 15 to 17, comprising a cap (164) adapted to be fixed to the rear or front part of the craft and configured to cooperate with the docking means (72) of the device (40).