Claims

1. A recovery method for recovering an underwater vehicle (8) by means of a recovery device (4) for a submarine (6), which comprises a docking device (10) for docking the underwater vehicle (8), wherein waves (19), more specifically light waves and/or sound waves (21), which propagate between the underwater vehicle (8) and the recovery device (4) from several markings (32) toward at least one sensor (24), are sensed (96) for a precise approach (60) of the underwater vehicle (8) onto the docking device (10) and ~~the~~a disposition, more specifically the positions and orientations, of the recovery device (4) and the underwater vehicle (8) relative to each other is determined thereby (82), wherein the source (18) of the waves (19) is related to the underwater vehicle (8) or the submarine (6) and~~.~~

~~2. The recovery method according to claim 1, wherein~~ a~~the~~ total propagation of the waves (19) from their source (18) to the sensor (24) comprises a propagation of the waves (19) from the underwater vehicle (8) to the recovery device (4).

2~~3~~. The recovery method according to claim 1 ~~or 2~~, wherein the markings (32) designed as reflectors (30) reflect (88) the waves (19) from their source (18) to the sensor (24).

3~~4~~. The recovery method according to one of the afore-mentioned claims, wherein the markings (32) designed as a source (18) of the waves (19) actively generate (90) the waves (19).

4~~5~~. The recovery method according to one of the afore-mentioned claims, wherein the recovery device (4) features the markings (32) and the waves (19) are sensed (98) on the underwater vehicle (8).

5~~6~~. The recovery method according to claim 4~~5~~, wherein several markings (32) specify a path, more specifically in the manner of runway markings (48), along which the underwater vehicle (8) orients itself and is thereby guided toward the docking device (10).

6~~7~~. The recovery method according to one of the claims 1-~~4~~3, wherein the underwater vehicle (8) features the markings (32) and the waves (19) are sensed (100) on the recovery device (4).

7~~8~~. The recovery method according to one of the afore-mentioned claims, wherein previous knowledge about a known disposition relative to each other of at least two, more specifically at least three markings (32) not disposed on a common straight line or at least four markings not disposed in the same plane is used to determined the disposition of the recovery device (4) and the underwater vehicle (8) relative to each other.

8~~9~~. The recovery method according to one of the afore-mentioned claims, wherein a more specifically spatial image of the markings (32) is generated by means of a more specifically optical and/or acoustic camera (49, 22) of the sensor (24) and this image is used for determining the disposition of the underwater vehicle 8 and the recovery device 4 relative to each other.

9~~10~~. The recovery method according to one of the afore-mentioned claims, wherein the underwater vehicle (8) maneuvers toward a garage (42) of the recovery device (4) featuring the docking device (10) by means of the determined disposition of the recovery device (4) and the underwater vehicle (8) relative to each other and is received in the garage (42).

10~~1~~. The recovery method according to one of the afore-mentioned claims, wherein in order to determine (74) the vertical position of the recovery device (4) and the underwater vehicle (8) relative to each other, the diving depths of the recovery device (4), more specifically of a submarine (6) with the recovery device (4), and of the underwater vehicle are compared (80), the diving depth of the underwater vehicle (8) being determined by measuring (76) the water pressure, and the determined vertical position is used for determining the disposition of the recovery device (4) and of the underwater vehicle (8) relative to each other.

11~~2~~. A recovery device with means for implementing the recovery method (53) according to one of the afore-mentioned claims by cooperating with an underwater vehicle (8)~~, more specifically according to claim 14~~.

12~~3~~. A submarine with the recovery device according to claim 1~~2~~1.

13~~4~~. An underwater vehicle with means for implementing the recovery method (53) according to one of the claims 1-10~~1~~ by cooperating with a recovery device (4)~~, more specifically~~ according to claim 11~~2~~, or with a submarine (6)~~, more specifically~~ according to claim 12~~3~~.

14~~5~~. A system with a recovery device (4)~~, more specifically~~ according to claim 11~~2~~, or with a submarine (6)~~, more specifically~~ according to claim 12~~3~~, with a recovery device (4), and with an underwater vehicle (8)~~, more specifically~~ according to claim 14~~3~~, wherein the recovery device (4) and the underwater vehicle (8) are configured in such a manner that they can co-operate in order to implement the recovery method (53) according to one of the claims 1 to 10~~1~~.

Claims

1. A recovery method for recovering an underwater vehicle (8) by means of a recovery device (4) for a submarine (6), which comprises a docking device (10) for docking the underwater vehicle (8), wherein waves (19), more specifically light waves and/or sound waves (21), which propagate between the underwater vehicle (8) and the recovery device (4) from several markings (32) toward at least one sensor (24), are sensed (96) for a precise approach (60) of the underwater vehicle (8) onto the docking device (10) and a disposition, more specifically the positions and orientations, of the recovery device (4) and the underwater vehicle (8) relative to each other is determined thereby (82), wherein the source (18) of the waves (19) is related to the underwater vehicle (8) or the submarine (6) and a total propagation of the waves (19) from their source (18) to the sensor (24) comprises a propagation of the waves (19) from the underwater vehicle (8) to the recovery device (4).

2. The recovery method according to claim 1, wherein the markings (32) designed as reflectors (30) reflect (88) the waves (19) from their source (18) to the sensor (24).

3. The recovery method according to one of the afore-mentioned claims, wherein the markings (32) designed as a source (18) of the waves (19) actively generate (90) the waves (19).

4. The recovery method according to one of the afore-mentioned claims, wherein the recovery device (4) features the markings (32) and the waves (19) are sensed (98) on the underwater vehicle (8).

5. The recovery method according to claim 4, wherein several markings (32) specify a path, more specifically in the manner of runway markings (48), along which the underwater vehicle (8) orients itself and is thereby guided toward the docking device (10).

6. The recovery method according to one of the claims 1-3, wherein the underwater vehicle (8) features the markings (32) and the waves (19) are sensed (100) on the recovery device (4).

7. The recovery method according to one of the afore-mentioned claims, wherein previous knowledge about a known disposition relative to each other of at least two, more specifically at least three markings (32) not disposed on a common straight line or at least four markings not disposed in the same plane is used to determined the disposition of the recovery device (4) and the underwater vehicle (8) relative to each other.

8. The recovery method according to one of the afore-mentioned claims, wherein a more specifically spatial image of the markings (32) is generated by means of a more specifically optical and/or acoustic camera (49, 22) of the sensor (24) and this image is used for determining the disposition of the underwater vehicle 8 and the recovery device 4 relative to each other.

9. The recovery method according to one of the afore-mentioned claims, wherein the underwater vehicle (8) maneuvers toward a garage (42) of the recovery device (4) featuring the docking device (10) by means of the determined disposition of the recovery device (4) and the underwater vehicle (8) relative to each other and is received in the garage (42).

10. The recovery method according to one of the afore-mentioned claims, wherein in order to determine (74) the vertical position of the recovery device (4) and the underwater vehicle (8) relative to each other, the diving depths of the recovery device (4), more specifically of a submarine (6) with the recovery device (4), and of the underwater vehicle are compared (80), the diving depth of the underwater vehicle (8) being determined by measuring (76) the water pressure, and the determined vertical position is used for determining the disposition of the recovery device (4) and of the underwater vehicle (8) relative to each other.

11. A recovery device with means for implementing the recovery method (53) according to one of the afore-mentioned claims by cooperating with an underwater vehicle (8).

12. A submarine with the recovery device according to claim 11.

13. An underwater vehicle with means for implementing the recovery method (53) according to one of the claims 1-10 by cooperating with a recovery device (4) according to claim 11, or with a submarine (6) according to claim 12.

14. A system with a recovery device (4) according to claim 11, or with a submarine (6) according to claim 12, with a recovery device (4), and with an underwater vehicle (8) according to claim 13, wherein the recovery device (4) and the underwater vehicle (8) are configured in such a manner that they can cooperate in order to implement the recovery method (53) according to one of the claims 1 to 10.