CLAIMS

1.- A shock-absorbing assembly (17) able to be interposed between a first element (14) and a second element (16) of an installation (10) at least partially submerged in a body of water (12), comprising:

- at least one group (40A to 40C) of hydraulic shock absorbers (42), each shock absorber (42) comprising a hydraulic jack (50) comprising a cylinder (54) intended to be supported by the first element (14), and a shock-absorbing member (58) partially received in the cylinder (54), the shock-absorbing member (58) having a head (64) protruding outside the cylinder (54), the head (64) being intended to come into contact with the second element (16) during mounting of the second element (16) on the first element (14);

characterized in that the shock-absorbing assembly (17) comprises, for each group (40A to 40C) of shock absorbers (42), a fluid accumulator (44) connected to each cylinder (54) of the group of shock absorbers (42), to allow a hydraulic fluid transfer between the different cylinders (54) of the group of shock absorbers (42) during contact between each head (64) and the second element (16).

2.- The assembly (17) according to claim 1, characterized in that the fluid accumulator (44) comprises a hollow body (100) delimiting an equilibration chamber (102) and an equilibration piston (104) mounted movably in the equilibration chamber (02), between a plurality of intermediate positions, wherein the equilibration piston (104) is free to move relative to the hollow body (100) in two opposite directions, and a downstream abutting position, in which the equilibration piston (104) is immobilized in at least one direction relative to the hollow body (100).

3.- The assembly (17) according to claim 2, characterized in that, in each intermediate position, the equilibration piston (104) sealingly delimits, in the equilibration chamber (102), an upstream region (112) designed to receive the hydraulic fluid coming from each hydraulic cylinder (50), and a downstream region (114) designed to contain a volume of gas able to be expelled outside the equilibration chamber (102), advantageously by a valve (110) emerging outside the equilibration chamber (32) in a constant-pressure gas volume.

4.- The assembly (17) according to any one of the preceding claims, characterized in that each shock-absorbing member (58) comprises a shock-absorbing piston (62) received in the cylinder (54), the head (64) being pivotably mounted along at least one axis relative to the shock-absorbing piston (62), the head (64) advantageously being connected to the shock-absorbing piston (62) by a ball joint connection.

5.- The assembly (17) according to any one of the preceding claims, characterized in that each shock absorber (42) comprises a base (80) designed to be fastened on the first element (14), the cylinder (54) of the hydraulic jack (50) being mounted pivoting around at least one axis relative to the base (80), between a straight rest configuration and a plurality of inclined configurations relative to the rest configuration.

6.- The assembly (17) according to claim 5, characterized in that each shock absorber (42) comprises at least one return member (86) for returning the cylinder (50) to its rest configuration.

7.- The assembly (17) according to any one of the preceding claims, characterized in that each shock absorber (42) comprises a mechanical locking mechanism (60), able to mechanically immobilize the shock-absorbing member (58) relative to the cylinder (54).

8.- The assembly (17) according to any one of the preceding claims, characterized in that it comprises at least two groups (40A to 40C) of hydraulic shock absorbers (42), advantageously at least three groups (40A to 40C) of hydraulic shock absorbers (42), designed to be spaced apart from one another on the first element (14).

9. The assembly (17) according to claim 8, characterized in that the hydraulic shock absorbers (42) of each group (40A to 40C) are each connected to a same fluid accumulator (44), advantageously shared between all of hydraulic shock absorbers (42) of all of the hydraulic shock-absorber (42) groups (40A to 40C).

10.- An installation (10) designed to be at least partially submerged in a body of water (12), characterized in that it comprises:

- a first element (14);

- a second element (16) assembled on the first element (14);

- a shock-absorbing assembly (17) according to any one of the preceding claims, interposed between the first element (14) and the second element (16), each cylinder (54) of each shock absorber (42) being supported by the first element (14), the head (64) of at least some of the shock absorbers (42) being in contact with the second element (16).

11.- The installation (10) according to claim 10, characterized in that the second element (16) is laid on the first element (14).

12.- The installation (10) according to one of claims 9 or 10, characterized in that the first element (14) is a support floating on a body of water (12) or fastened on the bottom of the body of water (12), the second element (16) being a deck (26) placed above the surface of the body of water (12).

13.- The installation (10) according to any one of claims 9 to 12, characterized in that the shock-absorbing assembly (17) can be disassembled with respect to the first element (14) and/or the second element (16).

14.- A method for mounting an installation (10) at least partially submerged in a body of water (12), comprising the following steps:

- providing a first element (14), and a shock-absorbing assembly (17) according to any one of claims 1 to 9, the cylinder (50) of each shock absorber (42) being supported by the first element (14), the head (64) of each shock-absorbing member (58) protruding outside the cylinder (50);

- placing the second element (16) in contact with the heads (64) of several shock absorbers (42) of the group (40A to 40C) of shock absorbers (42);

- free circulation of hydraulic fluid between the cylinders (50) of the group (40A to 40C) of shock absorbers (42) and the accumulator (44).

15.- The method according to claim 14, characterized in that the fluid accumulator (44) comprises a hollow body (100) delimiting an equilibration chamber (102) and an equilibration piston (104) mounted movably in the equilibration chamber (102), the free circulation of hydraulic fluid comprising a first phase in which the equilibration piston (104) moves freely in the equilibration chamber (102) under the effect of the hydraulic fluid coming from the cylinders (54) of the group (40A to 40C) of shock absorbers (42), and a second phase in which the equilibration piston (104) is immobilized in the equilibration chamber (102), and in which the hydraulic fluid present in the equilibration chamber (102) and the cylinders (54) is freely distributed between the equilibration chamber (102) and the cylinders (54).

16.- The method according to any one of claims 14 to 15, characterized in that each shock-absorbing member (58) comprises a shock-absorbing piston (62) received in the cylinder (54), the head (64) being pivotably mounted along at least one axis relative to the shock-absorbing piston (62), the method comprising, after placing the second element (16) in contact on the head (64) of at least one shock-absorbing member (58), pivoting of the head (64) relative to the shock-absorbing piston (62).

17.- The method according to any one of claims 14 to 16, characterized in that each shock absorber (42) comprises a base (80) designed to be fastened on the first element (14), the cylinder (54) of the hydraulic jack (50) being mounted pivoting around at least one axis relative to the base (80),

the method comprising, after placing the second element (16) in contact on the head (64) of at least one shock-absorbing member (58), pivoting of the cylinder (54) relative to the base (80) between a straight rest configuration and an inclined configuration relative to the rest configuration.

CLAIMS

1.- A shock-absorbing assembly (17) able to be interposed between a first element (14) and a second element (16) of an installation (10) at least partially submerged in a body of water (12), comprising:

- at least one group (40A to 40C) of hydraulic shock absorbers (42), each shock absorber (42) comprising a hydraulic jack (50) comprising a cylinder (54) intended to be supported by the first element (14), and a shock-absorbing member (58) partially received in the cylinder (54), the shock-absorbing member (58) having a head (64) protruding outside the cylinder (54), the head (64) being intended to come into contact with the second element (16) during mounting of the second element (16) on the first element (14);

characterized in that the shock-absorbing assembly (17) comprises, for each group (40A to 40C) of shock absorbers (42), a fluid accumulator (44) connected to each cylinder (54) of the group of shock absorbers (42), to allow a hydraulic fluid transfer between the different cylinders (54) of the group of shock absorbers (42) during contact between each head (64) and the second element (16), and in that the fluid accumulator (44) comprises a hollow body (100) delimiting an equilibration chamber (102) and an equilibration piston (104) mounted movably in the equilibration chamber (02), between a plurality of intermediate positions, wherein the equilibration piston (104) is free to move relative to the hollow body (100) in two opposite directions, and a downstream abutting position, in which the equilibration piston (104) is immobilized in at least one direction relative to the hollow body (100).

2.- The assembly (17) according to claim 1, characterized in that, in each intermediate position, the equilibration piston (104) sealingly delimits, in the equilibration chamber (102), an upstream region (112) designed to receive the hydraulic fluid coming from each hydraulic cylinder (50), and a downstream region (114) designed to contain a volume of gas able to be expelled outside the equilibration chamber (102), advantageously by a valve (110) emerging outside the equilibration chamber (32) in a constant-pressure gas volume.

3.- The assembly (17) according to any one of the preceding claims, characterized in that each shock-absorbing member (58) comprises a shock-absorbing piston (62) received in the cylinder (54), the head (64) being pivotably mounted along at least one axis relative to the shock-absorbing piston (62), the head (64) advantageously being connected to the shock-absorbing piston (62) by a ball joint connection.

4.- The assembly (17) according to any one of the preceding claims, characterized in that each shock absorber (42) comprises a base (80) designed to be fastened on the

first element (14), the cylinder (54) of the hydraulic jack (50) being mounted pivoting around at least one axis relative to the base (80), between a straight rest configuration and a plurality of inclined configurations relative to the rest configuration.

5.- The assembly (17) according to claim 4, characterized in that each shock absorber (42) comprises at least one return member (86) for returning the cylinder (50) to its rest configuration.

6.- The assembly (17) according to any one of the preceding claims, characterized in that each shock absorber (42) comprises a mechanical locking mechanism (60), able to mechanically immobilize the shock-absorbing member (58) relative to the cylinder (54).

7.- The assembly (17) according to any one of the preceding claims, characterized in that it comprises at least two groups (40A to 40C) of hydraulic shock absorbers (42), advantageously at least three groups (40A to 40C) of hydraulic shock absorbers (42), designed to be spaced apart from one another on the first element (14).

8. The assembly (17) according to claim 7, characterized in that the hydraulic shock absorbers (42) of each group (40A to 40C) are each connected to a same fluid accumulator (44), advantageously shared between all of hydraulic shock absorbers (42) of all of the hydraulic shock-absorber (42) groups (40A to 40C).

9.- An installation (10) designed to be at least partially submerged in a body of water (12), characterized in that it comprises:

- a first element (14);

- a second element (16) assembled on the first element (14);

- a shock-absorbing assembly (17) according to any one of the preceding claims, interposed between the first element (14) and the second element (16), each cylinder (54) of each shock absorber (42) being supported by the first element (14), the head (64) of at least some of the shock absorbers (42) being in contact with the second element (16).

10.- The installation (10) according to claim 9, characterized in that the second element (16) is laid on the first element (14).

11.- The installation (10) according to one of claims 9 or 10, characterized in that the first element (14) is a support floating on a body of water (12) or fastened on the bottom of the body of water (12), the second element (16) being a deck (26) placed above the surface of the body of water (12).

12.- The installation (10) according to any one of claims 9 to 11, characterized in that the shock-absorbing assembly (17) can be disassembled with respect to the first element (14) and/or the second element (16).

13.- A method for mounting an installation (10) at least partially submerged in a body of water (12), comprising the following steps:

- providing a first element (14), and a shock-absorbing assembly (17) according to any one of claims 1 to 8, the cylinder (50) of each shock absorber (42) being supported by the first element (14), the head (64) of each shock-absorbing member (58) protruding outside the cylinder (50);

- placing the second element (16) in contact with the heads (64) of several shock absorbers (42) of the group (40A to 40C) of shock absorbers (42);

- free circulation of hydraulic fluid between the cylinders (50) of the group (40A to 40C) of shock absorbers (42) and the accumulator (44).

14.- The method according to claim 13, characterized in that the free circulation of hydraulic fluid comprising a first phase in which the equilibration piston (104) moves freely in the equilibration chamber (102) under the effect of the hydraulic fluid coming from the cylinders (54) of the group (40A to 40C) of shock absorbers (42), and a second phase in which the equilibration piston (104) is immobilized in the equilibration chamber (102), and in which the hydraulic fluid present in the equilibration chamber (102) and the cylinders (54) is freely distributed between the equilibration chamber (102) and the cylinders (54).

15.- The method according to any one of claims 13 to 14, characterized in that each shock-absorbing member (58) comprises a shock-absorbing piston (62) received in the cylinder (54), the head (64) being pivotably mounted along at least one axis relative to the shock-absorbing piston (62), the method comprising, after placing the second element (16) in contact on the head (64) of at least one shock-absorbing member (58), pivoting of the head (64) relative to the shock-absorbing piston (62).

16.- The method according to any one of claims 13 to 15, characterized in that each shock absorber (42) comprises a base (80) designed to be fastened on the first element (14), the cylinder (54) of the hydraulic jack (50) being mounted pivoting around at least one axis relative to the base (80),

the method comprising, after placing the second element (16) in contact on the head (64) of at least one shock-absorbing member (58), pivoting of the cylinder (54) relative to the base (80) between a straight rest configuration and an inclined configuration relative to the rest configuration.