CLAIMS

1. A dynamic sealing device (10, 20, 30) configured to provide sealing between at least a first part and at least a second part having a relative rotational movement in relation to the first part, the dynamic sealing device being formed by a seal (11, 21, 31) comprising:

a body portion (14, 24A, 24B, 34);

a first main lip (12, 23A, 32) extending from the body portion;

a second main lip (13, 23B, 33) extending from the body portion, the first lip facing the second lip;

the first and second lips being configured to be energized by a first fluid so as to seal at least one of the first part and second part;

at least one additional lip (15, 25A, 25B, 35) located on the body portion remotely from the first and second lips, the at least one additional lip (15, 25A, 25B, 35) being configured to be energized by a second fluid pressing against the at least one additional lip (15, 25A, 25B, 35) so as to seal the at least one additional lip (15, 25A, 25B, 35) against at least the other of the first part and second part at a location of the body portion,

wherein the at least one additional lip (15, 25A, 25B, 35) is configured so that with the second fluid pressing the at least one additional lip (15, 25A, 25B, 35) against the at least the other of the first part and second part at the location of the body portion, both the body portion and the at least one additional lip are in contact with a same surface of the other of the first part and second part to be sealed, the body portion and the at least one additional lip (15, 25A, 25B, 35) together providing a sealing function against the same surface of the other of the first part and second part.

2. The dynamic sealing device according to claim 1, wherein the seal (11, 21, 31) is annular, the first and second lips (12, 13, 23A, 23B, 32, 33) each extend from the body portion (14, 24A, 24B, 34) generally in a radial direction of the seal, and the additional lip (15, 25A, 25B, 35) extends in a general direction perpendicular to the radial direction of the seal.

3. The dynamic sealing device according to claim 2, wherein the body portion (14, 24A, 24B, 34) and the first and second lips (12, 13, 23A, 23B, 32, 33) are configured such that the seal (11, 21, 31) has a general shape of a U or a V.

4. The dynamic sealing device according to claim 2, comprising several additional lips (25A, 25B).

5. The dynamic sealing device according to claim 1, comprising several additional

lips (25A, 25B).

6. The dynamic sealing device according to claim 1, wherein the first fluid and the second fluid are identical.

7. The dynamic sealing device according to claim 1, wherein the first fluid and the second fluid are different.

8. The dynamic sealing device according to claim 1, wherein,

the body portion of the seal (11, 21, 31) has an inside face (FI), the first main lip and the second main lip define an outside face (FE) of the seal, the outside face (FE) being an opposite face to the inside face,

the body portion, the first main lip and the second main lip define opposite lateral walls (PL1, PL2) which meet both the inside face at a first end of the seal and the outside face at a second end of the seal which is an opposite end to the first end;

the inside face delimiting the body portion (14, 24A, 24B, 34) at the first end of the seal, the outside face being formed by free ends of the first and second lips at the second end of the seal, and the lateral walls being formed by the respective outside faces of the first and second lips and by side walls of the body portion; and the first and second lips defining between them a cavity (CV) of the seal.

9. The dynamic sealing device according to claim 8, wherein the additional lip (15, 25A, 25B, 35) extends from a lateral wall (PL1, PL2) of the seal (11, 21, 31) projecting from a side wall of the body portion (14, 24A, 24B, 34).

10. The dynamic sealing device according to claim 9,

wherein the additional lip (15, 25A, 25B, 35) has an inclined face projecting from the side wall of the body portion (14, 24A, 24B, 34) and a bearing face which is an opposite face to the inclined face, the bearing face meeting the inside face (FI) of the seal (11, 21, 31), and

wherein the at least one additional lip (15, 25A, 25B, 35) is configured so that with the second fluid pressing the at least one additional lip (15, 25A, 25B, 35) against the at least the other of the first part and second part at the location of the body portion, both the inside face (FI) of the body portion and the bearing face (15-2) of the at least one additional lip are in contact with the same surface of the other of the first part and second part to be sealed.

11. The dynamic sealing device according to claim 8, wherein the body portion is provided with a cut-out forming a cavity in the inside face of the seal, and comprises one or more additional lips provided in the body portion located at the cut-out.

12. The dynamic sealing device according to claim 11, wherein the body portion is provided with a protection portion located at the inside face of the seal between the cut-out and one of its side walls.

13. The dynamic sealing device according to claim 11, wherein the body portion (24A, 24B) is provided with a channel opening at one end into the cavity formed by the cut-out in the inside face (FI) of the seal (21) and, at an opposite end, in a bottom of the cavity (CV) of the seal (21) delimiting the body portion remotely from the inside face.

14. The dynamic sealing device according to claim 13, wherein the first and second lips (23A, 23B) are configured to be energized by the first fluid and the additional lip or lips (25A, 25B) are configured to be energized also by the first fluid via the channel (CN) of the body portion (24A, 24B); the first fluid being a pressurization fluid.

15. The dynamic sealing device according to claim 8, wherein the first and second lips (12, 13, 32, 33) are configured to be energized by the first fluid and the additional lip (15, 35) is configured to be energized by the second fluid; the first fluid being a pressurization fluid and the second fluid being a main fluid to transfer from one of the first and second parts to the other of the first and second parts.

16. The dynamic sealing device according to claim 1, wherein the seal (21) is in two parts (22A, 22B), each part comprising a main lip (23A, 23B) and an additional lip (25A, 25B).

17. A connecting mechanism (4) for connecting at least a first part with at least a second part having a relative rotational movement in relation to the first part, comprising a first member (5) configured to be connected to the first part, a second member (6) movable relative to the first member (5) and configured to be connected to the second part, the first member (5) and the second member (6) being connected with each other for the transfer of a fluid from one of the first and second parts to the other of the first and second parts, as well as at least one sealing dynamic sealing device (10, 20, 30) according to claim 1 disposed in at least one groove (9) provided in the mechanism located at a junction between the first member (5) and the second member (6).

18. The connecting mechanism according to claim 17, wherein the first member (5) forms part of a mooring turret (3) of a floating production unit (1) and the second member (6) forms part of a platform extending from a ship (2) moored to the mooring turret.

19. The dynamic sealing device according to claim 1, wherein,

the body portion has an inside face (FI) and lateral walls (PL1, PL2),

the at least one additional lip extends from one of the lateral walls (PL2),

at least one additional lip has a first face (15-1) projecting from the one lateral wall (PL2) and a bearing face (15-2) which is an opposite face to the first face, the bearing face (15-2) meeting the inside face (FI) of the body portion,

wherein the at least one additional lip extends from the body portion and the bearing face meets the inside face of the body portion so that with the second fluid pressing the at least one additional lip against the at least the other of the first part and second part at the location of the body portion, both the inside face of the body portion and the bearing face of the at least one additional lip are in contact with the same surface of the other of the first part and second part to be sealed.

20. The dynamic sealing device according to claim 1, wherein,

the body portion has an inside face (FI),

the first main lip and the second main lip define an outside face (FE) of the seal, the outside face (FE) being an opposite face to the inside face (FI),

the body portion, the first main lip and the second main lip define opposite lateral walls (PL1, PL2) of the seal, the opposite lateral walls (PL1, PL2) each meeting both the inside face (FI) at a first end of the seal and the outside face (FE) at an opposite, second end of the seal,

the first and second main lips each extend from the body portion in a respective direction which is inclined relative to a radial direction of the seal,

the first and second main lips define there-between a cavity (CV), the cavity having a bottom delimiting the body portion remotely from the inside face (FI), the cavity having sides extending from the bottom formed by respective inside faces of the first and second main lips,

the at least one additional lip extends from one of the lateral walls (PL2) and projecting from a side wall of the body portion,

the first and second main lips each extend from the body portion in a radial direction of the seal, and the at least one additional lip extends in a direction perpendicular to the radial direction of the seal,

at least one additional lip has a first face (15-1) projecting from the one lateral wall (PL2) and a bearing face (15-2) which is an opposite face to the first face, the bearing face (15-2) meeting the inside face (FI) of the body portion,

wherein the at least one additional lip (15, 25A, 25B, 35) is configured so that with the second fluid pressing the at least one additional lip (15, 25A, 25B, 35) against the

at least the other of the first part and second part at the location of the body portion, both the inside face (FI) of the body portion and the bearing face (15-2) of the at least one additional lip are in contact with the same surface of the other of the first part and second part to be sealed.