Claims

1. A pump for conveying a process fluid, comprising:

a pump having an impeller rotatable about an axial direction;

a drive for the pump, the drive having a shaft configured to drive the impeller, and which connects the drive to the pump;

a restrictor extending around the shaft and being arranged between the impeller and the drive;

a housing having a pump inlet and a pump outlet for the process fluid, a barrier inlet for introduction of a barrier fluid into the drive and a barrier outlet for drainage of the barrier fluid from the housing; and

a plurality of storage chambers for the barrier fluid provided at the shaft in a region between the restrictor and the drive, the storage chambers being arranged behind one another with respect to the axial direction, with two adjacent storage chambers of the plurality of storage chambers being in flow communication with one another,

the barrier outlet and the barrier inlet being in flow communication with one another through a line so as to form a cooling circuit for the barrier fluid, with the cooling circuit comprising a heat exchanger, and

the plurality of storage chambers having a total volume which is at least as large as a thermally induced volume change of the barrier fluid in the cooling circuit based on an estimated temperature change of the barrier fluid.

2. A pump drive unit in accordance with claim 1, wherein each storage chamber of the plurality of storage chambers is configured as a ring space about the axial direction.

3. A pump drive unit in accordance with claim 1, wherein the two adjacent storage chambers are in flow communication through a restrictor gap, with the shaft forming a boundary surface of the restrictor gap.

4. A pump drive unit in accordance with claim 1, wherein the plurality of storage chambers includes between three and ten storage chambers.

5. A pump drive unit in accordance with claim 1, wherein at least one of the storage chambers is in the housing.

6. A pump drive unit in accordance with claim 1, wherein at least one of the storage chambers is in the shaft.

7. A pump drive unit in accordance with claim 1, wherein each of the storage chambers is in the housing.

8. A pump drive unit in accordance with claim 1, further comprising an injection apparatus configured to refill the barrier fluid.

9. A pump drive unit in accordance with claim 1, wherein the total volume of the plurality of storage chambers is at least 0.5% and at most 4% of a volume available for the barrier fluid in the cooling circuit.

10. A pump drive unit in accordance with claim 1, wherein the housing is a pressure housing.

11. A pump drive unit in accordance with claim 1, wherein the pump drive is configured to circulate a process fluid having a temperature of more than 400°C.

12. A pump drive unit in accordance with claim 1, wherein the drive is arranged beneath the pump with respect to a vertical.

13. A pump drive unit in accordance with claim 1, wherein the pump drive unit is an ebullating pump configured to circulate a process fluid.

14. A pump drive unit for conveying a process fluid, comprising:

a pump having an impeller rotatable about an axial direction;

a drive for the pump, the drive having a shaft configured to drive the impeller, and which connects the drive to the pump;

a restrictor extending around the shaft and being arranged between the impeller and the drive;

a housing having a pump inlet and a pump outlet for the process fluid, a barrier inlet for introduction of a barrier fluid into the drive and a barrier outlet for drainage of the barrier fluid from the housing; and

a plurality of storage chambers for the barrier fluid provided at the shaft in a region between the restrictor and the drive, the storage chambers being arranged behind one another with respect to the axial direction, with two adjacent storage chambers of the plurality of storage chambers being in flow communication with one another,

the barrier outlet and the barrier inlet being in flow communication with one another through a line so as to form a cooling circuit for the barrier fluid, with the cooling circuit comprising a heat exchanger, and

the plurality of storage chambers having a total volume which is twice as large as a thermally induced volume change of the barrier fluid in the cooling circuit based on an estimated temperature change of the barrier fluid.

15. A pump drive unit in accordance with claim 1, wherein the total volume of the plurality of storage chambers is 3% of a volume available for the barrier fluid in the cooling circuit.

16. A pump drive unit in accordance with claim 1, wherein the housing is a pressure housing for an operating pressure of at least 200 bar.

17. A pump drive unit in accordance with claim 1, wherein the drive is arranged next to the pump with respect to a horizontal.

18. A pump drive unit in accordance with claim 1, wherein the barrier inlet is arranged along the axial direction.