[Summary of Invention]

[Technical Problem]

[0005]

The reverse osmotic pressure is generated by a high pressure pump, and discharge pressure of the high pressure pump varies with an amount of water to be treated. When the amount of water to be treated is fixed, quality, temperature and salt concentration of the water to be treated are variation factors of the discharge pressure of the high pressure pump. Then, efficiency of the high pressure pump varies with the discharge pressure of the high pressure pump. As the temperature and salt concentration of the water to be treated vary, the discharge pressure of the high pressure pump varies as described above, and the efficiency of the high pressure pump is reduced in some cases.

[0006]

It is desirable that the discharge pressure of the high pressure pump is equalized as much as possible and the high pressure pump is operated at an efficient operation point as high as possible. Therefore, embodiments of the present invention seek to provide a desalination apparatus in which a high pressure pump can be operated at a high efficient operation point even when temperature, salt concentration or the like of water to be treated vary.

[Solution to Problem]

[0007]

According to an aspect of the present invention, there is provided a desalination apparatus comprising: a first module for separating raw water into first permeate water and first concentrated water by a reverse osmosis membrane; a first flow path for supplying the raw water to the first module; a second module for separating the first permeate water after separation in the first module into second permeate water and second concentrated water by a reverse osmosis membrane; a second flow path for supplying the first permeate water after

separation in the first module to the second module; a high pressure pump which is provided in the first flow path and supplies the raw water to the first module at high pressure to apply reverse osmotic pressure to the first module and the second module; a third flow path for supplying the second concentrated water after separation in the second module to upstream of the high pressure pump in the first flow path; and a fourth flow path for supplying a portion of the first concentrated water after separation in the first module to upstream of the high pressure pump in the first flow path.

[Advantageous Effects of Invention]

[0008]

According to embodiments of the present invention, it is possible to provide a desalination apparatus in which a high pressure pump can be operated at a high efficient operation point even when temperature, salt concentration or the like of water to be treated vary. Problems, configurations and effects other than those described above will be apparent from the following description of embodiments.

[Brief Description of Drawings]

[0009]

FIG. 1 is a system diagram of a desalination apparatus according to an embodiment 1 of the present invention;

FIG. 2 is a system diagram of a desalination apparatus according to an embodiment 2 of the present invention;

FIG. 3 is a system diagram of a desalination apparatus according to an embodiment 3 of the present invention;

FIG. 4 is a system diagram of a desalination apparatus according to an embodiment 4 of the present invention;

FIG. 5 is a system diagram of a desalination apparatus according to an embodiment 5 of