CLAIMS

1. An ion exchange device comprising, at an upper part, an anion exchange tank in which an anion-exchange resin is packed, and at a lower part, a cation exchange tank in which a cation-exchange resin is packed, wherein:

the cross-section of each of the anion exchange tank and the cation exchange tank is a substantially circular shape, and the diameter thereof is in the range of 500 mm to 3000 mm,

the bed height of the anion-exchange resin bed is in the range of 500 mm to 2000 mm, the bed height of the cation-exchange resin bed is in the range of 400 mm to 800 mm, the bed height of the anion-exchange resin bed is 1.5 to 2.5 times higher than the bed height of the cation-exchange resin bed, and the distance between the lower end of the anion exchange tank and the upper end of the cation exchange tank is in the range of 500 mm to 1000 mm,

the anion exchange tank and the cation exchange tank each independently have an outer shell that is constituted by end plates having an outwardly convex shape that are provided at an upper portion and a lower portion and also by a support body of an ion exchange tank side portion, and comprise an upper chamber, a resin-packed chamber and a lower chamber which are partitioned from each other by two upper and lower flat plates; and

a window equipped with a transparent material, an ion-exchange resin supply port and discharge port are installed in the side wall of the anion exchange tank and the cation exchange tank,

an equipment such as a manhole that enables the entry and exit of a person in the side wall of the anion exchange tank and the cation exchange tank and in end plate portions provided at the top and bottom of the anion exchange tank

and the cation exchange tank,

the anion exchange tank and the cation exchange tank are allowed to communicate by communication means provided outside of the anion exchange tank and the cation exchange tank;

the ion exchange device further comprising a supply/discharge pipe for supplying or discharging a liquid to or from the upper portion of the anion exchange tank, and a supply/discharge pipe for supplying or discharging a liquid to or from the lower portion of the cation exchange tank;

the communication means comprising:

a first communication pipe for supplying/discharging a liquid to/from the lower portion of the anion exchange tank,

a second communication pipe for supplying/discharging a liquid to/from the upper portion of the cation exchange tank,

a third communication pipe that allows the first communication pipe and the second communication pipe to communicate,

opening/closing means for opening/closing the third communication pipe, and

supply/discharge means for supplying/discharging a regenerant solution, that is provided in each of the first communication pipe and the second communication pipe;

wherein:

a water collection/distribution member that allows water to pass therethrough and prevents passage of an ion-exchange resin is disposed in the flat plate, and

the supply/discharge pipe at the upper portion of the anion exchange tank, the first communication pipe, the second communication pipe and the supply/discharge pipe at the lower portion of the cation exchange tank communicate with end plates provided at the upper portion and the lower portion

of the anion exchange tank and the cation exchange tank, respectively.

2. An ion exchange device comprising, at an upper part, a cation exchange tank in which a cation-exchange resin is packed, and at a lower part, an anion exchange tank in which an anion-exchange resin is packed, wherein:

the cross-section of each of the anion exchange tank and the cation exchange tank is a substantially circular shape, and the diameter thereof is in the range of 500 mm to 3000 mm,

the bed height of the anion-exchange resin bed is in the range of 500 mm to 2000 mm, the bed height of the cation-exchange resin bed is in the range of 400 mm to 800 mm, the bed height of the anion-exchange resin bed is 1.5 to 2.5 times higher than the bed height of the cation-exchange resin bed, and the distance between the lower end of the anion exchange tank and the upper end of the cation exchange tank is in the range of 500 mm to 1000 mm,

the cation exchange tank and the anion exchange tank each independently have an outer shell that is constituted by end plates having an outwardly convex shape that are provided at an upper portion and a lower portion and also by a support body of an ion exchange tank side portion, and comprise an upper chamber, a resin-packed chamber and a lower chamber which are partitioned from each other by two upper and lower flat plates; and

a window equipped with a transparent material, an ion-exchange resin supply port and discharge port are installed in the side wall of the anion exchange tank and the cation exchange tank,

an equipment such as a manhole that enables the entry and exit of a person in the side wall of the anion exchange tank and the cation exchange tank and in end plate portions

provided at the top and bottom of the anion exchange tank and the cation exchange tank,

the cation exchange tank and the anion exchange tank are allowed to communicate by communication means provided outside of the cation exchange tank and the anion exchange tank;

the ion exchange device further comprising a supply/discharge pipe for supplying or discharging a liquid to or from the upper portion of the cation exchange tank, and a supply/discharge pipe for supplying or discharging a liquid to or from the lower portion of the anion exchange tank;

the communication means comprising:

a first communication pipe for supplying/discharging a liquid to/from the lower portion of the cation exchange tank,

a second communication pipe for supplying/discharging a liquid to/from the upper portion of the anion exchange tank,

a third communication pipe that allows the first communication pipe and the second communication pipe to communicate,

opening/closing means for opening/closing the third communication pipe, and

supply/discharge means for supplying/discharging a regenerant solution, that is provided in each of the first communication pipe and the second communication pipe;

wherein:

a water collection/distribution member that allows water to pass therethrough and prevents passage of an ion-exchange resin is disposed in the flat plate, and

the supply/discharge pipe at the upper portion of the cation exchange tank, the first communication pipe, the second communication pipe and the supply/discharge pipe at

the lower portion of the anion exchange tank communicate with end plates provided at the upper portion and the lower portion of the anion exchange tank and the cation exchange tank, respectively.

3. The ion exchange device according to claim 1 or claim 2, wherein a cross-sectional diameter of the anion exchange tank and a cross-sectional diameter of the cation exchange tank are a same length.

4. A method of using an ion exchange device according to any one of claims 1 to 3, comprising feeding raw water into a cation exchange tank at a linear velocity (LV) of 50 m/hr or more so as to cause an ion-exchange resin to float and perform treatment of the raw water.