What is claimed is:

1. A membrane filtration system, comprising:

a treatment bath;

a membrane support frame disposed in the treatment bath;

a separation membrane module installed in the membrane support frame;

a reciprocating part connected with the membrane support frame to reciprocate the membrane support frame in a reciprocating direction;

a sludge floating part disposed on a lower end of the membrane support frame to float sludge accumulated in the treatment bath; and

a filtered-water discharge part configured to discharge water filtered via the separation membrane module and to slide in the reciprocating direction in response to a reciprocating motion of the membrane support frame, the filtered-water discharge part comprising:

a water collection pipe installed perpendicular to the reciprocating direction and configured to collect the filtered water from the separation membrane module; and

a recovery pipe to recover the filtered water externally, the recovery pipe having a first end coupled to the water collection pipe and a second end configured to accommodate the sliding of the filtered-water discharge part in the reciprocating direction.

2. The membrane filtration system according to claim 1, wherein the separation membrane module comprises an upper frame, a lower frame, and a plurality of hollow fiber membranes provided between the upper frame and the lower frame.

3. The membrane filtration system according to claim 2, wherein a sump is provided in the upper frame, and the sump and a hollow portion of the hollow fiber membranes are in fluid communication with each other.

4. The membrane filtration system according to claim 3, wherein the recovery pipe comprises: a first recovery pipe connected to the water collection pipe made of a rigid material; and a second recovery pipe connected to the first recovery pipe made of a pliable material.

5. The membrane filtration system according to claim 4, wherein a suction pump is connected to the second recovery pipe to pump the filtered water.

6. The membrane filtration system according to claim 4, wherein the upper frame includes an upper side having a discharge hole via which the water collection pipe is in fluid communication with the sump.

7. The membrane filtration system according to claim 3, further comprising: a filtration pipe disposed in the membrane support frame, wherein the separation membrane module includes a plurality of separation membrane modules respectively coupled to the filtration pipe.

8. The membrane filtration system according to claim 7, wherein the filtration pipe includes a plurality of coupling holes, each of the plurality of coupling holes coupled to a respective end of the upper frame, whereby the sump and the filtration pipe are in fluid communication with each other.

9. The membrane filtration system according to claim 8, wherein the filtration pipe is disposed on a central portion of an upper side of the membrane support frame, and the plurality of separation membrane modules is symmetrically coupled to both sides of the filtration pipe.

10. The membrane filtration system according to claim 7, wherein the filtration pipe is arranged to be perpendicular to the reciprocating direction of the membrane support frame.

11. The membrane filtration system according to claim 2, wherein each of the upper and the lower frames comprises an interval maintaining part protruding from each of the upper and the lower frames.

12. The membrane filtration system according to claim 11, wherein the interval maintaining part comprises a coupling part and a pair of adjacent interval maintaining parts, the pair of adjacent interval maintaining parts including first and second interval maintaining parts, the coupling part operable to couple the first interval maintaining part to the second

interval maintaining part.

13. The membrane filtration system according to claim 2, wherein the plurality of hollow fiber membranes are arranged in a plurality of bundles, the respective bundles being spaced apart from each other.

14. The membrane filtration system according to claim 2, wherein each hollow fiber membrane has a length that is greater than a distance (Lo) between the upper frame and the lower frame and less than or equal to (Lo+0.1(Lo)).

15. The membrane filtration system according to claim 1, wherein the separation membrane module includes a plurality of separation membrane modules respectively installed in the membrane support frame.

16. A membrane bioreactor, comprising:

a biological treatment train performing at least one biological treatment process among anaerobic, anoxic and aerotropic processes; and

a membrane filtration system comprising

a treatment bath;

a membrane support frame disposed in the treatment bath;

a separation membrane module installed in the membrane support frame;

a reciprocating part connected with the membrane support frame to reciprocate the membrane support frame in a reciprocating direction;

a sludge floating part disposed on a lower end of the membrane support frame to float sludge accumulated in the treatment bath; and

a filtered-water discharge part configured to discharge water filtered via the separation membrane module and to slide in the reciprocating direction in response to a reciprocating motion of the membrane support frame, the filtered-water discharge part comprising:

a water collection pipe installed perpendicular to the reciprocating direction and configured to collect the filtered water from the separation membrane module; and

a recovery pipe to recover the filtered water externally, the recovery pipe having a first end coupled to the water collection pipe and a second end configured to accommodate the sliding of the filtered-water discharge part in the reciprocating direction.