

SETTLING TANK

FIELD OF THE INVENTION

[0001] The present invention relates to a settling
5 tank (sedimentation equipment) for solid liquid
separation of raw water and, more particularly, to a
settling tank in which at least a part of raw water fed
to a center of a tank body rises-up along a wall of the
tank body so that the raw water is clarified, and the
10 clarified water overflows over an overflowing section.

BACKGROUND OF THE INVENTION

[0002] Conventional sedimentation equipment
comprises plain sedimentation equipment, inclined-plate
15 sedimentation equipment, and coagulation sedimentation
equipment. The plain sedimentation equipment may be
either rectangular or circular. Rectangular
sedimentation equipment is generally of horizontal-flow
type, called "transverse-flow sedimentation basin".
20 Circular sedimentation equipment may be of an up-flow
type or a horizontal-flow type. For clarification,
sedimentation equipment of horizontal-flow type is
employed.

[0003] In the transverse-flow sedimentation basin,
25 density flow is generated due to difference in the density
of raw water and clarified water. The transverse-flow
sedimentation basin is accordingly provided with a
flow-in baffle, flow-out baffle and/or intermediate

baffle for uniforming the flow therein so as to improve solid liquid separation efficiency. The circular sedimentation equipment allows easy collection of sedimentated sludge. A structural example of circular settling tank is shown in Fig. 4. In this circular settling tank, raw water is fed into a central feed well 2, arranged in the center of a tank body 1, through a raw water feed pipe 3. The raw water flows from the bottom of the central feed well 2 to expand into a lower portion of the tank body 1 and rises-up along the tank body 1. During this, solids are settled and separated, and the clarified water overflows over an overflowing weir 4 to flow out of the tank body 1. The settled solids are collected into a discharge portion 7 by a sludge collector rake 6, which is rotated by a driving unit 5, and are discharged through a discharge pipe 8.

[0004] The inclined-plate sedimentation equipment is a settling tank having inclined plates or horizontal plates installed inside the tank body. Clarified water is produced beneath each plate. This sedimentation equipment is based on the principle that the greater the area of the plates, the greater the settling area is and faster clarified water will be produced. Therefore, the separation area can be increased in proportion to an increase in the area of the plates. Therefore, the water surface load ($\text{m}^3/\text{m}^2\text{h}$) can be reduced, thereby achieving the separation of particles having low settling velocity.

[0005] Such settling tanks with inclined plates are

described in JP H5-45363 U, JP H5-200205 A. In the settling tanks described in JP H5-45363 U and JP H5-200205 A, however, the inclined plates are placed over a wide range, thus resulting in high cost.

5 Patent Document 1: JP publication H5-45363 U

 Patent Document 2: JP laid open H5-200205 A

SUMMARY OF THE INVENTION

[0006] An object of the present invention is to provide
10 a settling tank, which has excellent solids separation efficiency and yet has a relatively simple structure.

[0007] A settling tank of the present invention has a tank body and an overflowing section disposed at an upper portion of the tank body, in which at least a part
15 of raw water fed to the center of the tank body rises-up along an inner surface of a wall of the tank body and overflows over the overflowing section to flow out as clarified water, and is characterized in that at least
20 one inclined plate is disposed on the inner surface of the wall of the tank body.

[0008] In the settling tank of the present invention, most of raw water fed to the center of the tank body flows along the bottom of the tank body toward the inner surface of the tank wall, and then rises-up along the inner
25 surface of the wall. During this, the solids are settled and scoured, so that clarified water overflows over the overflowing section at the upper portion of the tank body.

[0009] In the present invention, since at least one inclined plate is disposed on the wall of the tank body,

efficient clarification can be achieved while the water rises-up along the wall of the tank body. The inclined plate(s) is (are) enough to be disposed on the wall of the tank body. Therefore, the number of the inclined
5 plates to be installed can be reduced as compared to the conventional one, thereby allowing simple structure and reducing the cost for equipment.

BRIEF DESCRIPTION OF THE DRAWINGS

10 **[0010]** Fig. 1 is a vertical sectional view of a settling tank according to an embodiment;

Fig. 2a is a view on arrows of a line II-II of Fig. 1 and Fig. 2b is a sectional view taken along a line B-B of Fig. 2a;

15 Fig. 3 is a side view of inclined plates in another embodiment; and

Fig. 4 is a vertical sectional view of a conventional settling tank.

20 DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0011] Hereinafter, a preferred embodiment of the present invention will be described with reference to Figs. 1, 2a, and 2b.

25 **[0012]** A settling tank 10 of this embodiment has a tank body 11 which is circular and a feed well 12 which is located at the center of the tank body 11. The feed well 12 is cylindrical and has upper and lower open ends. The upper end of the feed well 12 projects upward from water

level of the tank body 1. The tank body 1 is provided with a pit-like discharge portion 13 at the bottom center for collecting and discharging the settled solids.

5 **[0013]** A bottom surface 11a of the tank body 11 is formed into a conical shape tilting downward from wall 11b to the center of the tank body.

10 **[0014]** A number of inclined plates 14 are disposed on the inner surface of the wall 11b. Each inclined plate 14 is a substantially rectangular flat plate of which one vertical side is fixed to the vertical wall 11b. The distances between adjacent inclined plates 14 are constant and the angles of inclination θ (angle from horizontal plane) of the inclined plates 14 are equal. The angle of inclination θ of the inclined plate 14 is
15 preferably from 45° to 80° , especially from about 55° to about 70° . The inclined plates 14 are arranged all around the wall 11b. In this embodiment, the lower sides of the inclined plates 14 are positioned above the bottom surface 11a separated by a predetermined distance. The
20 upper sides of the inclined plates 14 are positioned below the water level of the tank body 11. The width L of each inclined plate 14 is preferably from about 10% to about 30% of the radius of the tank body 11.

25 **[0015]** An overflowing weir 15 as an overflowing section is disposed around the upper edge of the wall 11b.

[0016] In the settling tank 10 having the aforementioned structure, raw water is fed into the feed well 12. The water flows mainly along the bottom surface

11a and the inner surface of the wall 11b, overflows over the overflowing weir 15, and is discharged through a clarified water discharge pipe 16. Since the raw water flows between adjacent inclined plates 14 while flowing
5 along the vertical wall 11b, efficient sedimentation treatment is achieved. Solids flow down along the inner surface of the wall 11b and further flow on the bottom surface 11a to the pit-like discharge portion 13, from which the solids are discharged out of the tank body 11.

10 **[0017]** Though the inclined plates 14 are simple flat plates which are inclined in only one direction in this embodiment, the inclined plates may be inclined plates 14A which are bent in zigzags along the vertical direction as shown in Fig.3.

15 **[0018]** In the present invention, raschig-ring-like porous fillers may be filled between adjacent inclined plates 14 (or 14A) to divide flow paths between adjacent inclined plates into small paths.

[0019] In the present invention, a sludge collector
20 rake unit which rotates along the bottom surface of the tank body may be provided as shown in Fig.4.

[0020] Though the tank body 11 has a circular shape as seen in plan view in the aforementioned embodiment, the tank body may have a square shape, a polygon shape
25 equal to or more than pentagon, or an elliptical shape.

[0021] The present invention may be adopted to another settling tank for various processes, besides the wastewater treatment.

WHAT IS CLAIMED IS:

1. A settling tank comprising a tank body and an overflowing section disposed at an upper portion of the tank body, in which at least a part of raw water fed to
5 the center of the tank body rises-up along an inner surface of a vertical wall of the tank body and overflows over the overflowing section to flow out as clarified water, wherein at least one inclined plate is disposed on the inner surface of said wall.

10 2. A settling tank as claimed in claim 1, wherein a feed well is disposed at the center of the tank body so that the raw water is fed to the bottom portion of the tank body through the feed well.

3. A settling tank as claimed in claim 2, wherein
15 the bottom surface of the tank body tilts downward from the lower end of said wall to the center of said tank body.

4. A settling tank as claimed in claim 1, wherein the inclined plate is a substantially rectangular flat
20 plate of which one side is fixed to the inner surface of said wall.

5. A settling tank as claimed in claim 1, wherein a plurality of the inclined plates are arranged at regular intervals all around the inner surface of said wall.

25 6. A settling tank as claimed in claim 1, wherein the angle of inclination, i.e., the angle from horizontal, of the inclined plate is from 45° to 80°.

7. A settling tank as claimed in claim 4, wherein the width of the inclined plate is from 10% to 30% of

the radius of the tank body.

8. A settling tank as claimed in claim 1, wherein the inclined plate is bent in zigzags along the vertical direction.

5 9. A settling tank as claimed in claim 1, further comprising a sludge collector rake unit which rotates along the bottom surface of the tank body.