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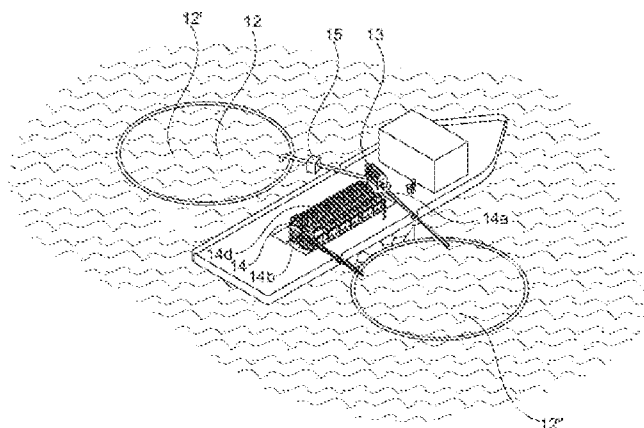
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(73)	Proprietor	Stranda Prolog AS, Langøyneset, 6530 AVERØY, Norge			
(72)	Inventor	Klaus Hoseth, Nerlandsvegen 27, 6416 MOLDE, Norge Jacob Hoseth, Munkerudåsen 18 D, 1165 OSLO, Norge Kåre Hoseth, Hasseløy, 6530 AVERØY, Norge			
(74)	Agent or Attorney	ACAPO AS, Postboks 1880 Nordnes, 5817 BERGEN, Norge			

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(57)	Abstract	

A device and a method for the treatment of fish in a net cage installation are described where the device comprises a tank with a treatment agent the fish is treated in and where the tank comprises a conveyor mechanism for the fish in the tank. Also described is a system where a device to treat the fish is a part of a floating installation, such as a ship or a raft.



Field of the invention

The present invention relates to a device at a fish farm net cage to treat or vaccinate farmed fish against parasites and disease, where the device comprises a tank with a treatment agent in which the fish shall be treated and where the tank comprises a conveyor mechanism for the fish in the tank. The invention also relates to application of a device and a system for treatment of farmed fish in an cage.

Background of the invention

Fish farming is more and more common and today makes up a large and important industry. Attacks of disease and/or parasites lead to large economic losses and also a considerable suffering for the fish.

The description of the invention given below is exemplified with the farming of salmon and with salmon lice as the damaging parasite as this currently represents a considerable challenge for the fish farming industry in Norway, but the invention comprises all forms of bath treatment of fish.

During a disease attack, and in particular infectious diseases, it is common to treat the farmed fish with medication to fight the disease. The medication can be administered to the fish in several different ways, where the most common for farmed fish is injection of the medicine directly into the fish, oral administration of the medicine as an additive to the feed that is given to the fish, or that the medication is added to the aqueous environment (bath treatment) in which the organisms live.

One aim of the present invention is to provide a device, method and system to be able to administer treatment agents to farmed fish at the fish farm installation. The agents are administered to an aqueous environment through which the fish is led.

In addition to the device and the methods according to the invention being used to treat a disease for farmed fish, the device can alternatively be used to give a preventative effect, such as that different vaccines are administered (dip vaccination), or that the agents are directly aimed at the cause of the disease/infection, such as bacteria, virus, amoeba, parasites etc., to kill these or to prevent an attack.

We will also emphasise that “treatment” does not necessarily imply that a chemical or medicine is added to the aqueous environment. In some cases one can use fresh water in the tank, for example to fight amoebae, and in other cases one can change the temperature of the aqueous environment, such as, for example, that one raises or
5 lowers the temperature.

For the treatment of lice, either preventatively to prevent that an aquatic environment becomes infected by lice, or to prevent the lice being attracted to the fish, or to prevent the lice getting fastened onto the fish or to remove lice that are fastened to the fish,
10 there are known techniques to supply so called salmon lice agents to the water in which the fish live. The salmon lice agents are mixed into or added to the water, either directly or indirectly to the net cages where the fish are.

Today, there are different solutions where the net cage is surrounded by a cloth or
15 tarpaulin to demarcate the aqueous environment, and in some cases the net cage is hoisted up so that the volume of water one wants to treat becomes somewhat smaller. Regardless, it is a problem that the volume of water is very large, which means that a considerable amount of chemicals must be used for the treatment. Furthermore, such systems are to a more or less extent open, and one does not have complete control of
20 the contamination caused by the chemicals to the environment, whether it is to the ocean bed or the aqueous environment surrounding the net cage installations.

There are also solutions where the fish are transferred from the net cage to containers or tanks, for example, tanks on board well ships. Such systems are closed in that one
25 has control of the water and the treatment agents that are supplied and are removed from the system.

WO2010/087722 describes a unit for the transfer of fish from one net cage to another via a chute that is led into the wall section of the net cages. Water from the one net
30 cage will flow through the unit and to the next net cage. The treatment agent is added in the chute. This solution makes dewatering of the fish impossible during the transfer to and from the tank, and with no regulation of the residence time in the treatment unit with a conveyor mechanism that has a pre-determined direction and speed. Therefore, this solution will lead to discharges of the treatment agents to the surrounding
35 environment and an inexact residence time for the fish in the treatment means.

US 4,363,290 describes a solution where fish are led into a reservoir that contains a treatment agent. This solution can not be used for continuous treatment of fish in the vicinity of a fish farm. Similarly, use of US 4,363,290 leads to the fish lying dry on the conveyor that brings them down into the bath. This is very arduous for the fish and limits the survival rate for the fish that shall be treated. For salmon and trout such a treatment would lead to an unacceptable death rate if the unit was used at a farm for edible fish.

NO332298 describes a solution where the fish are pumped through an arched pipeline where a zone of the pipeline contains a treatment agent. This solution does not have a conveyor mechanism and the fish will therefore not have an accurate residence time in the treatment agent. This weakness is particularly obvious when the volume of the treatment bath is large in relation to the size of the fish.

The present invention provides a device and a solution that represents an improvement of these systems, and in particular the aim of the invention is to provide a solution where the treatment of the fish takes place continuously in a loop, where the residence time in the treatment bath can be regulated and where there is a total replacement of the aqueous environment before entering the treatment tank and at the transfer from the treatment tank.

With the term "continuous" in the context of this invention is meant that the fish are led from the net cage and over into a treatment unit, through the treatment unit and out again of the treatment unit in a continuous process, i.e. as an on-line treatment in a loop. This does not prevent that the conveyor mechanism can be operated and be stopped at intervals to optimise the treatment time or other operating parameters.

In a presently preferred solution the device for the treatment of farmed fish, also described as the treatment unit, comprises a screw tank, for example of the Helix tank type, where the fish are fed in at the one end of the tank, are treated with different agents as they are continuously being fed through the aqueous environment of the tank, until they are fed out of the other end of the tank. The residence time in the tank can be regulated, and added chemicals and removal of water and other agents to and from the tank can be regulated also.

The difference between the solution according to the invention and solutions that are known from prior art is that the system according to the invention is "continuous", while

the known solutions are batch or fed batch-wise, i.e. one carries out the treatment in the net cage or in the space of a well boat. In the batch-wise treatments the fish are first placed in a treatment volume, thereafter the agent is added and the agent is thereafter diluted again.

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With a continuous treatment there will be a treatment agent in the tank. The fish are added to the tank and the residence time in the treatment tank for the fish is regulated by the conveyor mechanism that leads the fish through the tank so that the residence time for each fish is approximately the same, i.e. that the fish are fed out of the tank in approximately the same order as they come into the tank. Furthermore, the tank volume is relatively limited since only a limited number of the fish in a net cage at any given time will be in the treatment tank. This represents a considerable advantage as the consumption of chemicals can be reduced, at the same time as one can precisely control the content of the tank.

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Summary of the invention

In a first aspect the present invention relates to a device for the treatment or vaccination of farmed fish against parasites and diseases at a fish farm where the device comprises a tank with a treatment agent in which the fish are treated, and where the tank comprises a conveyor mechanism for the fish in the tank, characterised in that the tank is a screw tank and the conveyor mechanism has several blades that bring the fish through the tank from the inlet to the outlet in a pre-determined direction and speed to give the fish a pre-determined residence time in the tank, and where the device comprises means for the transfer of the fish from a first body of water via dewatering means and the inlet to a new water environment in the tank and via dewatering means and an outlet to a new body of water.

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In one embodiment the conveyor mechanism comprises more than two blades.

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In one embodiment the blades of the conveyor mechanism are fitted onto a chain or driving belt that is driven forward for the transport of said farmed fish through the tank.

In one embodiment is the tank a Helix tank type.

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In one embodiment the tank has a vertical, cylindrical-circular shape with radial blades fastened to a central axis that splits the treatment volume into sections, and where the pre-determined speed and direction are regulated by the rotation of said axis.

- 5 In one embodiment the device comprises further conveyor mechanisms for the transport of fish to/from net cages and the tank, where said conveyor mechanisms optionally comprise a conveyor belt and pumps such as a Mamut pump, vacuum pump, ejector pump or centrifugal pump.
- 10 In one embodiment, said dewatering means that is placed between the first net cage and the tank, and/or between the tank and the second net cage is a sorting machine.

In one embodiment said sorting machine(s) are not for primary straining, but is placed between the dewatering means and the tank or between the last dewatering means at
15 the tank outlet and the net cage.

In one embodiment the tank comprises one or more inlets for the supply of liquid and different treatment means.

- 20 In one embodiment the device comprises several tanks set up to carry out several treatments of said fish.

In one embodiment the tank comprises one or more sensors for the measurement of different parameters such as temperature, pH, O₂ and ORP, concentration of different
25 treatment agents, density of organisms in the tank (fish counter), and also a measuring unit for the amount of water and dosing pumps with a measuring unit for the amount of additions.

In one embodiment the device comprises means for automation, such as means for
30 the regulation of the supply and exit of the number of fish to/from the tank, means for the regulation of the through flow of liquid and residence time, means for the regulation of the supply of, and concentration of, treatment agents, etc.

In a second aspect the present invention relates to an application of a device as given
35 above for the treatment of farmed fish in a net cage, where said fish are transferred from one net cage via dewatering means and an inlet to a treatment tank set up so that the fish are taken up in a new aqueous environment and that said fish are transported,

in a pre-determined direction and speed, by a conveyor mechanism with blades through the treatment tank and that the fish, after the treatment, are led out of the tank via dewatering means to a new aqueous environment.

- 5 In one embodiment the residence time of the fish in the tank can be regulated.

In one embodiment the treatment agent is supplied to the tank via a number of inlets so that the aqueous environment in the tank becomes homogenous.

- 10 In one embodiment said treatment is set up to prevent and/or treat diseases for said farmed fish.

In one embodiment said treatment is set up to remove parasites from the fish.

- 15 In one embodiment said parasite is lice, preferably salmon lice, and that the treatment comprises treating the fish with an adequate agent which effectively fights the lice and/or removes the lice from the fish, where said agent is chosen from pyrethroids, pyrethrum, organophosphates, chitin inhibitors, avermectines and hydrogen peroxide where said hydrogen peroxide is preferably added to seawater or water with a low salt
20 content.

In one embodiment said treatment is for the removal of amoebae and where said water in the treatment is fresh water or water with a low salt content.

- 25 In one embodiment, where said parasite is lice, preferably salmon lice, the treatment comprises treating the fish with water with added ozone.

- In a third aspect the present invention relates to a system for the treatment of farmed fish from a net cage characterised in that the system comprises a treatment device as
30 given above, arranged as a part of a floating installation and where the treatment device comprises a tank with a treatment agent in which the fish are treated and where the tank is a screw tank and comprises a conveyor mechanism for the fish in the tank, characterised in that the conveyor mechanism has several blades that bring the fish through the tank from the inlet to the outlet at a pre-determined direction and speed, to
35 give the fish a pre-determined residence time in the tank, and where the device comprises means for the transfer of the fish from a first body of water via a dewatering

means and the inlet to a new aqueous environment in the tank arranged in said floating installation and via dewatering means and an outlet to a new aqueous environment.

In one embodiment said floating installation is a vessel, such as a ship.

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In one embodiment said floating installation is a raft.

In one embodiment the conveyor mechanism is a screw fitted in the screw tank.

10 In one embodiment the screw in said screw tank can be detached from the tank.

In one embodiment the tank is fitted with a lid or a cover that is placed over the tank as the screw is removed.

15 In one embodiment, where said vessel is a ship, the screw in said screw tank can be removed from the tank.

In one embodiment the tank is a vertical circular cylindrical tank with radial blades.

20 In one embodiment the tank is on board a boat and where a number of the radial blades can be dismantled when the boat is used for purposes other than that described above.

A representative device according to the invention will be described below with reference to the enclosed figures, where,

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Figure 1 shows a perspective outline of a principal diagram of a device according to the invention.

30 Figure 2 shows an embodiment where a screw tank is used for on-line treatment of farmed fish.

At a net cage installation which encompasses a number of net cages 12, a tank 14 is placed in the loop for the treatment of fish from the net cages 12. In the description of the example given below, the treatment is exemplified by the removal of salmon lice that have become fastened to the fish, but the device can be used for any bath treatment of fish.

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The treatment is not carried out in the net cages 12 themselves, but the fish are transferred via dewatering means 13 to a separate treatment unit, i.e. a loop ("on-line") is established through which the fish are transported and this loop comprises at least one tank 14. As the tank is used to take up water with a treatment agent, the term

5 "treatment unit" is also used about this tank 14. Such a tank 14 can be permanently arranged in the vicinity of the net cages 12, but it is preferably mobile with regard to the net cage installation, and it is preferably placed on board a raft or barge, or it can be an integrated part of a vessel such as a ship.

10 The transfer of fish from the net cages 12 to the treatment unit or tank 14 can be carried out in any suitable way and the invention is not limited to how this is carried out. In the transfer between the net cage and tank, the fish is dewatered, i.e. the fish are separated from the aqueous environment they were in and are transferred to a new aqueous environment. Different such means 13 can be used for the dewatering of the

15 fish and in the different embodiments, grids and/or sorting machines are used.

One also seeks to achieve an efficient transfer of the fish from the net cage 12 to the tank 14 and from the tank 14 to the net cage 12, at the same time as the fish are treated as gently as possible. To avoid getting a replacement of the water in the

20 different net cages 12 and the tanks 14 a transport system that ensures dewatering of the fish is used as mentioned, i.e. the fish are separated from the water they were in and are transferred to a new aqueous environment. Such dewatering means 13 can be arranged as grooves or grids, or openings in the pump system so that one achieves that the organisms are separated from the aqueous environment in which they were

25 originally.

As an example of a dewatering means 13 a sorting machine is shown in figure 1. Water and fish are pumped from a net cage 12' by, for example, a pump 15 via the sorting machine. In this sorting machine the water is drained at the same time as

30 unwanted fish are removed. For example, one can remove small fish, such as small pollack and wrasse so that these are not led to the treatment unit 14. One can remove the pollack while the wrasse is returned (without going via the treatment tank) to one of the net cages 12". A fish counter can be placed between the sorting machine and the treatment unit 14, for the counting of the fish that are led into the treatment unit 14.

35 Alternatively, a such fish counting is carried out at a different place in the process, for example, in the treatment unit 14.

The fish enter the treatment tank 14 via one or more inlets 14a and are transferred to a new aqueous environment, i.e. the one in the treatment tank 14. The aqueous environment which is in the treatment unit 14 is particularly chosen considering the treatment the fish is to be subjected to. For removal of lice the water can contain agents that are effective in the treatment of salmon lice, such as pyrethroids, pyrethrum, organophosphates, chitin inhibitors, avermectines, hydrogen peroxide and ozone. The water contains sufficient amounts of one or more of such treatment agents for an effective delousing to take place during the time the fish stay in the tank 14. The loop-characteristic of the system makes it possible to use ozone as an agent where previously, due to a rapid taking up in large bodies of water one could only use hydrogen peroxide.

The residence time in the tank, i.e. how long time a given fish stays in the tank from entering the tank till it is fed out of the tank, can simply be regulated by the conveyor mechanism. For a helix-tank the blades, i.e. the part of the screw thread which is submerged into the water, and the flow of water will push the fish through the tank, and the speed of this feeding can be set by regulating the speed of rotation of the shaft to which the blades are fastened.

Furthermore, the tank is fitted with a number of inlets and outlets to supply or remove water and/or treatment agents, or other components, to and from the tank. A screw tank is shown in figure 2 with inlets, such as the inlet 14e for the dosing of water, inlet 14f for the dosing of oxygen, inlet 14g for the dosing of treatment agent. Also shown in figure 2 is the set up 14h for the removal of protein, heat exchanger 14i, mixer 14j, sensors 14k, straining grid 14l and overflow 14m.

In some embodiments the temperature of the water bath is important and the tank 14 is then fitted with means to be able to supply water at any temperature to the tank 14. In some embodiments the tank is insulated so that the temperature of the water is maintained for a long time period. It is also possible to use a cooler to lower the temperature in the treatment bath. Then, one can carry out the treatment with oxygen radicals, such as hydrogen peroxide and ozone during the summer. In today's method with hydrogen peroxide in a well boat one can not always treat fish during the summer because of the unwanted effects of hydrogen peroxide on the fish at high temperatures.

It is preferred that the tank is fitted with a number of sensors 14k, where these are arranged and set up so that they can monitor different parameters. This can be parameters such as pH, O₂ and ORP, temperature of the water, salt content of the water, the concentration of different treatment agents, the number of organisms in the water, etc. In a preferred embodiment sensors are arranged that can monitor if lice are fastened to the salmon, i.e. so that one gets a picture of whether the treatment is finished.

It is possible to divide up the tank in different zones so that different treatments can be given in the different zones. However, it is presently preferred, if the fish shall be subjected to different treatments, to carry this out in separate tanks 14 which are connected in series.

The treatment water can be supplied to the treatment tank 14 by the help of pumps so that the mixture becomes homogenous (for example, with respect to the concentration of treatment agents) throughout the whole tank 14. It is also possible to add treatment agents at different locations in the tank 14 so that one can, for example, amplify the effect if the treatment agents are weakened or consumed in the treatment.

The essential element of the device according to the invention is that one has an on-line treatment, i.e. the fish are fed evenly and gradually through the treatment unit itself.

CLAIMS

1. Device for the treatment or vaccination of farmed fish against parasites and disease at a fish farm net cage (12) where the device comprises a tank (14) with a treatment agents in which the fish shall be treated, and where the tank (14) comprising a conveyor mechanism (14d) for the fish in the tank, characterised in that the tank (14) is a screw tank and that the conveyor mechanism (14d) has several blades (14e) that drive the fish through the tank (14) from the inlet (14a) to the outlet (14b) in a pre-determined direction and speed to give the fish a pre-determined residence time in the tank (14) and where the device comprises means for the transfer of the fish from a first body of water (12') via dewatering means (13) and the inlet (14a) to a new aqueous environment in the tank (14) and via dewatering means (14l) and outlet (14b) to a new body of water (12'').
2. Device according to claim 1, characterised in that the conveyor mechanism (14d) comprises more than two blades (14e).
3. Device according to claim 1, characterised in that said conveyor mechanism (14d) comprises blades (14e) fitted on a chain or belt that is driven forward for the conveying of said farmed fish through the tank (14).
4. Device according to claim 1, characterised in that the tank (14) is a Helix-tank type.
5. Device according to claim 1, characterised in that the tank (14) has a vertical circular cylindrical form with radial blades (14e) fastened to a central axis (14d) that divides the treatment volume into sectors and where the pre-determined speed and direction are regulated by the rotation of said axis (14d).
6. Device according to one of the claims 1-5, characterised in that the device (10) further comprises conveyor mechanisms for the transport of fish to/from the net cages (12) and the tank (14), where said conveyor mechanism optionally comprises conveyor belts and pumps such as a Mamut pump (15), vacuum pump, ejector pump or centrifugal pump.

7. Device according to one of the claims 1-6, characterised in that said dewatering means (13) placed between the first net cage (12') and the tank (14) and/or between the tank (14) and the second net cage (12'') is a sorting machine.
- 5 8. Device according to claim 7, characterised in that said sorting machine(s) does not contain the primary sieving, but that it is placed between the dewatering means (13) and the tank (14) or between the last dewatering means (14l) at the outlet (14b) of the tank and the net cage (12'').
- 10 9. Device according to one of the claims 1-8, characterised in that the tank (14) comprises one or more inlets for the supply of liquid and different treatment agents.
10. Device according to one of the claims 1-9, characterised in that the device comprises a number of tanks (14) set up to carry out several treatments of said fish.
- 15 11. Device according to one of the claims 1-10, characterised in that the tank (14) comprises one or more sensors for the measurement of different parameters such as temperature, pH, O₂ and ORP, concentration of different treatment means, density of organisms in the tank (fish counter), and also measuring units for the amount of water and dosing pumps with measuring units for the amount of additives.
- 20 12. Device according to one of the claims 1-11, characterised in that the device comprises means for automation, such as means for the regulation of the supply and removal of the number of fish to/from the tank (14), means for the regulation of the through-flow of liquid and residence time, means for the regulation of the supply and concentration of treating agents, etc.
- 25 13. Application of a device according to one of the claims 1-12 for the treatment of farmed fish at a fish farm net cage, where said fish are transferred from a net cage (12) via dewatering means (13) and an inlet (14a) to a treatment tank (14) set up so that the fish are taken up in a new aqueous environment, and that said fish are transported, at a pre-determined speed and direction with a conveyor mechanism (14d) with blades (14e) through the treatment tank (14) and that after the treatment the fish are brought out of the tank (14) via dewatering means (13) to a new aqueous environment.
- 30 14. Application according to claim 13, where the residence time of the fish in the tank (14) can be regulated.
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15. Application according to one of the claims 13-14, where the treatment agent is added to the tank (14) via several inlets so that the aqueous environment in the tanks is homogeneous.

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16. Application according to one of the claims 13-15, where said treatment is set up to prevent and/or treat diseases for said farmed fish.

17. Application according to one of the claims 13-16, where said treatment is set up to remove parasites from fish.

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18. Application according to claim 17, where said parasite is lice, preferably salmon lice, and that the treatment comprises to treat the fish with an adequate agent which effectively fights lice and/or removes the lice from the fish, where said agent is chosen from pyrethroids, pyrethrum, organophosphates, chitin inhibitors, avermectines and hydrogen peroxide, where said hydrogen peroxide is preferably added to seawater or water with a low salt content.

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19. Application according to one of the claims 12-18, where said treatment is for the removal of amoeba and where said water in the treatment is fresh water or water with a low salt content.

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20. Application according to claim 17, where said parasite is lice, preferably salmon lice, and that the treatment comprises to treat the fish with water to which ozone is added.

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21. System for treatment of farmed fish from a net cage, wherein the system comprises a treatment device according to one of the claims 1-12 arranged as a part of a floating installation, and where the treatment device comprises a tank (14) with a treatment means in which the fish is treated and where the tank (14) is a screw tank and comprises a conveyor mechanism (14d) for the fish in the tank, characterised in that the conveyor mechanism (14d) has a number of blades (14e) that brings the fish through the tank (14) from the inlet (14a) to the outlet (14b) with a given speed and direction to give the fish a pre-determined residence time in the tank (14), and where the device comprises means for the transfer of the fish from a first body of water (12') via dewatering means (13) and the inlet (14a) to a new aqueous environment in the

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tank (14) arranged in said floating installation and via dewatering means (14l) and outlet (14b) to a new body of water (12”).

22. System according to claim 21, characterised in that said floating installation is a
5 vessel, such as a ship.

23. System according to claim 21, characterised in that said floating installation is a raft.

10 24. System according to claim 21, where said conveyor mechanism is a screw fitted in said screw tank.

25. System according to claim 21, characterised in that the screw in said screw
15 tank can be removed from the tank.

26. System according to claim 25, characterised in that the tank (14) is fitted with a lid or cover that is placed over the tank as the screw is removed.

27. System according to one of the claims 21-22, where said vessel is a ship,
20 characterised in that the screw in said screw tank can be removed from the tank.

28. System according to claim 19, where the tank is a vertical circular cylindrical tank with radial blades.

25 29. System according to claim 25, where the tank is on board a boat and where a number of the radial blades can be dismantled when the boat is used for purposes other than what is described in claim 21.

Patentkrav

1. Anordning for å behandle eller vaksinere oppdrettsfisk mot parasitter og sykdommer ved oppdrettsmerd (12) hvor anordningen omfatter en tank (14) med
5 behandlingsmiddel som fisken behandles i, og hvor tanken (14) omfatter en framføringsmekanisme (14d) for fisk i tanken, karakterisert ved at tanken (14) er en skruetank og at framføringsmekanismen (14d) har et flertall skovler (14e) som fører fisken gjennom tanken (14) fra innløp (14a) til utløp (14b) med forutbestemt retning og hastighet, for å gi fisken en forutbestemt oppholdstid i tanken (14) , og hvor
10 anordningen omfatter midler for overføring av fisken fra et første vannvolum (12') via avvanningsmidler (13) og innløpet (14a) til et nytt vannmiljø i tanken (14) og via avvanningsmidler (14l) og utløp (14b) til et nytt vannvolum (12'').
2. Anordning i samsvar med krav 1, karakterisert ved at fremføringsmekanismen
15 (14d) omfatter mer enn to skovler (14e).
3. Anordning i samsvar med krav 1, karakterisert ved at nevnte transportmekanisme (14d) omfatter skovler (14e) montert på kjede eller reim som drives framover for fremføring av nevnte oppdrettsfisk gjennom tanken (14).
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4. Anordning i samsvar med krav 1, karakterisert ved at tanken (14) er av type Helix-tank.
5. Anordning i samsvar med krav 1, karakterisert ved at tanken (14) har en
25 vertikal sirkulærsylindrisk form med radielle skovler (14e), festet til en sentral akse (14d), som deler behandlingsvolumet i sektorer, og der den forutbestemte hastighet og retning reguleres av rotasjon av nevnte akse (14d).
6. Anordning i samsvar med et av kravene 1-5, karakterisert ved at anordningen
30 ytterligere omfatter transportmekanismer for transport av fisk til/fra merder (12) og

tank (14), hvor nevnte transportmekanismer valgfritt omfatter transportbånd og pumper så som Mamutpumpe (15), vakuumpumpe, ejektor- eller sentrifugalpumpe.

7. Anordning i samsvar med et av kravene 1-6, karakterisert ved at nevnte avvanningsmidler (13) arrangert mellom første merd (12') og tank (14), og/eller mellom tank (14) og andre merd (12''), er en sorteringsmaskin.
8. Anordning i samsvar med krav 7, karakterisert ved at nevnte sorteringsmaskin(er) ikke inneholder den primære avsiling, men at den plasseres mellom avvanningsmidler (13) og tank (14) eller mellom den siste avvanningsmiddel (14I) ved tankens utløp (14b) og merd (12'').
9. Anordning i samsvar med et av kravene 1-8, karakterisert ved at tanken (14) omfatter én eller flere innganger for tilførsel av væske og ulike behandlingsmidler.
10. Anordning i samsvar med et av kravene 1-9, karakterisert ved at anordningen omfatter et flertall tanker (14) innrettet for å gjennomføre flere behandlinger av nevnte fisk.
11. Anordning i samsvar med et av kravene 1-10, karakterisert ved at tanken (14) omfatter én eller flere sensorer for måling av ulike parametere så som temperatur, pH, O₂ og ORP, konsentrasjon av ulike behandlingsmidler, tetthet av organismer i tanken (fisketeller), samt mengdemåler for vann og doseringspumper med mengdemåling for tilsetning.
12. Anordning i samsvar med et av kravene 1-11, karakterisert ved at anordningen omfatter midler for automatisering, så som midler for regulering av tilførsel og utgang av antall fisk til/fra tanken (14), midler for regulering av væskegjennomstrømning og oppholdstid, midler for regulering av tilførsel og konsentrasjon av behandlingsmidler, etc.

13. Anvendelse av en anordning ifølge et av kravene 1-12 for behandling av oppdrettsfisk ved oppdrettsmerd, hvor nevnte fisk overføres fra en merd (12) via avvanningsmidler (13) og et innløp (14a) til en behandlingstank (14) innrettet slik at fisken opptas i et nytt vannmiljø, og at nevnte fisk transporteres, med forutbestemt
5 retning og hastighet, med en fremføringsmekanisme (14d) med skovler (14e) gjennom behandlingstanken (14) og at fisken etter behandling føres ut av tanken 14 via avvanningsmidler (13) til et nytt vannmiljø.
14. Anvendelse i samsvar med krav 13, hvor fiskens oppholdstid i tanken (14) kan
10 reguleres.
15. Anvendelse i samsvar med et av kravene 13-14, hvor behandlingsmiddel tilføres tanken (14) via et flertall innganger slik at vannmiljøet i tanken blir homogent.
- 15 16. Anvendelse i samsvar med et av kravene 13-15, hvor nevnte behandling er innrettet for å hindre og/eller behandle sykdom hos nevnte oppdrettsfisk.
17. Anvendelse i samsvar med et av kravene 13-16, hvor nevnte behandling er innrettet for å fjerne parasitter fra fisk.
20
18. Anvendelse i samsvar med krav 17, hvor nevnte parasitt er lus, fortrinnsvis lakselus, og at behandlingen omfatter å behandle fisken med et adekvat middel som effektivt bekjemper lusen og/eller fjerner lusen fra fisken, hvor nevnte middel er valgt blant pyretroider, pyretrum, organofosfater, kitinhemmere, avermektiner og
25 hydrogenperoksid, hvor nevnte hydrogenperoksid fortrinnsvis er tilsatt i sjøvann eller vann med lavt saltinnhold.
19. Anvendelse i samsvar med et av kravene 12-18, hvor nevnte behandling er for fjerning av amøber, og hvor nevnte vann i behandlingen er ferskvann eller vann
30 av lav saltgehalt.

20. Anvendelse i samsvar med krav 17, hvor nevnte parasitt er lus, fortrinnsvis lakselus, og at behandlingen omfatter å behandle fisken med vann som er tilsatt ozon.

- 5 21. System for behandling av oppdrettsfisk fra en merd, hvor systemet omfatter en behandlingsanordning ifølge et av kravene 1-12 anordnet som en del av en flytende installasjon, og hvor behandlingsanordningen omfatter en tank (14) med behandlingsmiddel som fisken behandles i, og hvor tanken (14) er en skruetank og omfatter en framføringsmekanisme (14d) for fisk i tanken, karakterisert ved at
- 10 framføringsmekanismen (14d) har et flertall skovler (14e) som fører fisken gjennom tanken (14) fra innløp (14a) til utløp (14b) med forutbestemt retning og hastighet, for å gi fisken en forutbestemt oppholdstid i tanken (14) , og hvor anordningen omfatter midler for overføring av fisken fra et første vannvolum (12') via avvanningsmidler (13) og innløpet (14a) til et nytt vannmiljø i tanken (14) anordnet i nevnte flytende
- 15 installasjon og via avvanningsmidler (14l) og utløp (14b) til et nytt vannvolum (12'').

22. System i samsvar med krav 21, karakterisert ved at nevnte flytende installasjon er et fartøy, så som et skip.

- 20 23. System i samsvar med krav 21, karakterisert ved at nevnte flytende installasjon er en flåte.

24. System i samsvar med krav 21, hvor nevnte fremføringsmekanisme er en skrue montert i nevnte skruetank.

25

25. System i samsvar med krav 21, karakterisert ved at skruen i nevnte skruetank er løsgjørbar fra tanken.

26. System i samsvar med krav 25, karakterisert ved at tanken (14) er utstyrt med et
- 30 lokk eller deksel som legges over tanken idet skruen er fjernet.

27. System i samsvar med et av kravene 21-22, hvor nevnte fartøy er et skip, karakterisert ved at skruen i nevnte skruetank er løsgjørbar fra tanken.

5 28. System i samsvar med krav 19, der tanken er en vertikal sirkulærsylindrisk tank med radielle skovler.

29. System i samsvar med krav 25, der tanken er om bord på en båt og hvor et antall av de radielle skovlene kan demonteres når båten benyttes til andre formål enn det som er beskrevet i krav 21.

2/2

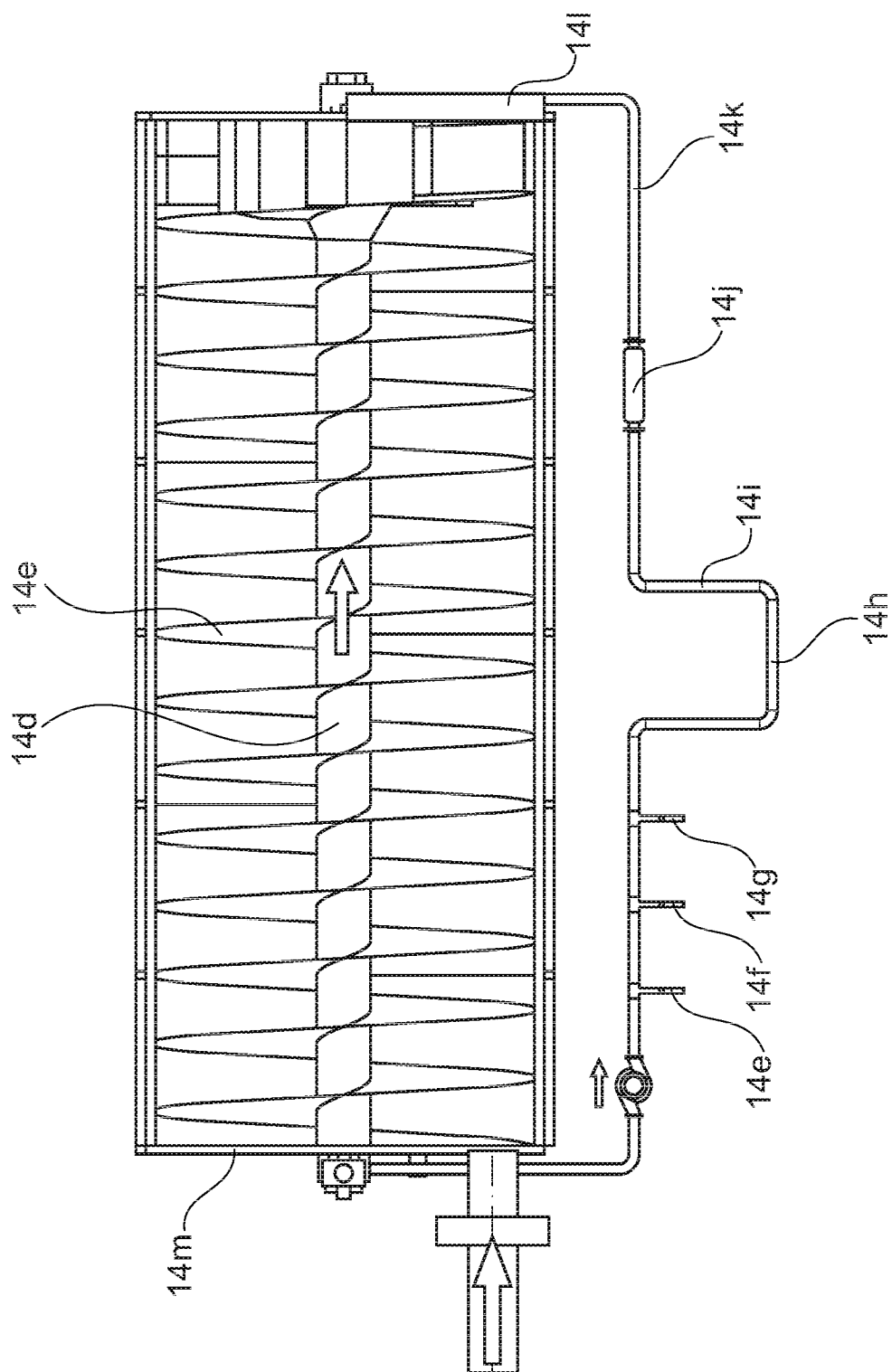


Fig. 2