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(54) **Title**: FISH CONVEYANCE CORRIDOR AND METHOD FOR SHORT DISTANCE CONVEYANCE OF LIVE FISH

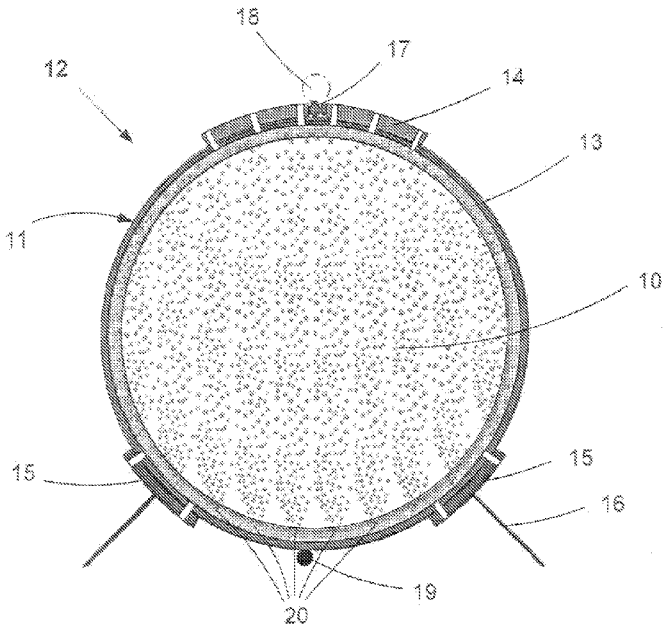

Fig. 2

(57) **Abstract**: Fish conveyance corridor (10) comprising at least one physical wall (11). The conveyance corridor comprises at least one source (13, 17, 18) for periodic generation of gas bubbles arranged under the conveyance corridor and intersecting this. A method is also disclosed for short distance conveyance of live fish by use of the conveyance corridor (10), establishing at least one row of gas bubbles intersecting the conveyance corridor, functioning partly as a wall partly as an audial incentive for fish to move away from the gas bubbles.

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Fish conveyance corridor and method for short distance conveyance of live fish

The present invention concerns a device and a method for short distance conveyance of fish.

Background

In connection with fish farming there is a need of frequently move live fish from one fish cage to another, from a fish cage to a treatment plant or from a cage, intermediate cage or tank to a plant for fish slaughtering. Particularly due to the need for vaccinating fish or illness treatment the need for such conveyance of fish is significant.

In all such cases it is desirable to do this as simple and inexpensive as possible and without causing too much damage or stress to the fish. Different kinds of pumps for pumping live fish have been suggested. While there has been a substantial development in this area, pumping is still a method that exposes the fish for significant pressure variations which causes a high stress level with accompanying loss of appetite and reduced quality of the slaughtered fish.

A device for conveyance of fish with the use of pumps is known from WO 02078436.

Objectives

It is an object of the present invention to provide a method and equipment for easily and efficiently and with a minimum of stress, to convey live fish between different storage units, such as tanks, fish cages etc.

The present invention

Said objectives are achieved by the present invention which according to a first aspect concerns a conveyance corridor as defined by claim 1.

According to another aspect the present invention concerns a method as defined by claim 11.

Preferred embodiments of the invention are disclosed by the dependent claims.

The conveyance corridor comprises in a convenient embodiment a pipeline with walls of fishing net, i.e. of fabric having openings to the environment. The corridor can have circular, square, oval or other cross-sectional shape, but it is simple and in many connections preferred that the cross-section is circular. Since the walls are soft and without carrying capacity, they need to be supported by a framework to not collapse. The framework may be in any material, e.g. synthetic, composite, steel and aluminium and typically is comprised by discrete frames arranged at fixed mutual intervals. In addition each individual frame comprises a frame tube arranged to distribute pressurized gas to the cross-section of the conveyance corridor via nozzles along the tube. The tube may, but need not, be made in a material constituting a main part of the framework. It is

thus an option to use rigid tubes having the double function of holding open the conveyance corridor and distributing gas, or soft tubes may be attached to a more rigid frame, the soft tubes only having the function of distributing gas bubbles.

The conveyance corridor can be held vertically in place by means of secured buoyant bodies or float balls. Hawsers along the conveyance corridor can be used to stretch it in longitudinal direction. Weight or ballast bodies attached to the lower part of certain frames may contribute so stabilizing the conveyance corridor in the water and may serve as attachment points for hawsers being arranged mainly radially from the conveyance corridor to stretch it out.

Below the invention is described in further detail by means of a non-limiting exemplifying embodiment.

Figure 1 is a schematic perspectival view of a segment of a conveyance corridor according to the present invention.

Figure 2 shows a cross-section of the conveyance corridor shown in Figure 1.

Figure 1 shows a segment of a conveyance corridor 10 with walls of fishing net 11 and which by frames 12 is divided into a number of length sections L. The dimensions may vary significantly but the radius of such a corridor may typically vary from half a meter to 2 meter and may in certain cases also be outside these limits. Also the length dimensions can vary significantly but will typically be at least as large as the diameter of the corridor, from 1 meter and more, typically 4-5 meter when the radius is in the order of magnitude 1.5 meter. The distance L between the frames and the dimensions of the conveyance corridor are adapted to the type and size of the fish.

In Figure 2 a cross-section of the conveyance corridor 10 from Figure 1 is shown at a frame 12. The frame 12 comprises a circularly frame tube 13 in a hollow and comparatively rigid material which is suited for stretching out the wall 11 of the corridor. At the top of the frame tube 13 buoyant bodies 14 are attached and near the bottom of the frame tube 13 two mutually balanced ballast bodies 15 are attached, serving to stabilizing the frame tube 13 and thereby the frame 12 and in last instance the entire conveyance corridor 10 in desired position in the sea. It is indicated that radially arranged hawsers 16 may be attached to the tube 13 at the ballast bodies 15 to optionally secure or thereby further stabilize the frame 12 and thereby the conveyance corridor 10. The hawsers 16 can at their other end be attached to any suitable object in the actual case, that being the sea bottom, a vessel side, weights or anchors. At the top of the frame tube 13 a valve 17 is shown connected to a longitudinally extending supply hose 18 for pressurized gas. Any harmless gas can be used and in practice air is typically preferred. The valve 17 can be adjusted from zero supply to a supply having a typical operational pressure of 6 bar. Each frame tube 13

along the length of the corridor 10 has a valve 17 that can be controlled independent of the other valves.

As also shown in Figure 2 a number of perforations 20 are localized at rather small intervals along the lower half of the frame tube 13, so that gas being supplied to the frame tube via the valve 17, will rise up in the form of bubbles from the perforations 20, forming a dense "curtain" that fish will seek to avoid contact with.

The hose 18 for pressurized air typically has a rigidity that makes it serve to hold out the conveyance corridor in its longitudinal direction. Furthermore a hawser 19 may be used at the other side of the periphery of the corridor also to contribute to holding the conveyance corridor tightly outstretched. It is not required that the hose 18 for pressurized air is positioned at the top points of the frame tubes and the hawser.

In the longitudinal direction the conveyance corridor can be tightened by use of longitudinally extending hawsers as shown by 19 at the lowermost part of the frame 12 in Figure 2. Exposed parts of the conveyance corridor such as their connection to a fish cage, boat, fleet or tank, may advantageously be reinforced by means of tarpaulins, double wall or double sewing.

The conveyance corridor shown in the drawings is circumferentially closed but when arranging a conveyance corridor at sea surface it is not required that it has a ceiling.

Manner of operation

The conveyance corridor is with regard to physical construction conventional with the exception of the frames which serve the purpose of periodically setting up curtains of gas bubbles that will prevent fish from passing through. In addition the noise from gas bubble will be disturbing to the fish and it will move away from the gas bubbles thereby moving from one length section to the next one. When all fish has moved at least one length section away from the first one providing gas bubbles, the next (second) valve 17 is opened so that second frame tube 13 sets up a curtain of gas bubbles. Supply of gas to the first frame tube can now be terminated since the bubbles in the second frame will prevent the fish from returning. It might be said that the conveyance corridor has moveable partition walls of gas- or air bubbles, but it is worth noticing that the bubbles not only constitute walls, they also generate noise, increasing with increasing supplied gas pressure, which contributes to making the fish move in the same direction all the time. In this manner the fish can be urged to move slowly and at its own chosen speed from length section to length section. It is thus not exposed to unacceptable levels of stress. Supply of pressurized air at pressure levels in the range 4-6 bar has proven to be effective for the present invention. Large fish may required somewhat higher pressure levels than smaller fish.

To make the fish start to move initially, displacement may be used, i.e. a gradual reduction of the available volume in which it reside in the direction of the starting point of the conveyance corridor or use of particular noise signals, e.g. addition of gas bubbles at certain positions outside the conveyance corridor.

It may be relevant to use particular equipment such as underwater cameras to monitor and thereby improve the control of the conveyance, but that is not part of the present invention.

The present invention is a comparatively simple arrangement when the frames are mass produced. A quiet and substantially continuous movement of fish can be achieved or a desired number of fish can be "portioned" out and moved forward. There is no accumulation of fish at which crush and stress can be excessive and there is no risk of damage to the fish, contrary to what is the case when fish is pumped.

Claims

1. Fish conveyance corridor (10) comprising at least one physical wall (11), **characterized in** comprising at least one source (13, 17, 18) for periodic generation of gas bubbles arranged under the conveyance corridor and intersecting same.

2. Fish conveyance corridor (10) according to claim 1, **characterized in** that the at least one physical wall (11) has the form of a pipeline made of fishing net which at certain intervals is outstretched by frames (12) dividing the conveyance corridor into length sections (L) starting at one frame (12) and ending at the closest subsequent frame (12).

3. Fish conveyance corridor (10) according to claim 2, **characterized in** that each frame (12) comprises frame tube (13) having perforations (20) arranged to generate gas bubbles from a gas source (18) to the entire cross-section of the conveyance corridor.

4. . Fish conveyance corridor (10) according to claim 2, **characterized in** that each frame (12) is arranged to outstretch the fishing net wall (11).

5. . Fish conveyance corridor (10) according to claim 2, **characterized in** that it has the shape of a tunnel in which the fishing net wall (11) is cylindrical and the frame (12) is circular.

6. . Fish conveyance corridor (10) according to claim 2, **characterized in** that the upper part of each frame 812) is provided with at least one buoyant member (14) while the lower part of each frame is provided with at least one ballast member (15).

7. . Fish conveyance corridor (10) according to claim 2, **characterized in** that it is held in place vertically by means of buoyant members.

8. . Fish conveyance corridor (10) according to claim 2, **characterized in** that radially arranged hawsers (16) attached to the frames (12) contributes to holding the wall (11) of the conveyance corridor outstretched.

9. . Fish conveyance corridor (10) according to claim 2, **characterized in** that longitudinally running hawsers (19) attached to the frames (12) are arranged to stretch out the conveyance corridor (10) in its longitudinal direction.

10. Fish conveyance corridor (10) according to claim 1, **characterized in** having a mainly cylindrical shape, that separate ballast members (15) are arranged symmetrically around the lower part of the frames (12), that separate buoyant members (14) are arranged around the upper part of the frames (12), that the gas source (18) is a longitudinally running gas pipe for supply of gas through valves (17) at each frame tube (13), that the longitudinally running gas tube has a rigidity sufficient to contribute to the stretching out of the conveyance corridor (10) in its longitudinal direction at its upper side, while a longitudinally running hawser (19) contributes to stretch out the conveyance corridor (10) along its lower side.

11. Method for short distance conveyance of live fish comprising providing a conveyance corridor (10) which is delimited by at least one physical wall (11), **characterized in** providing a row of gas bubbles intersecting the conveyance corridor, functioning partly as a wall, partly as an audial incentive for fish to move away from the gas bubbles.

12. Method (10) according to claim 11, **characterized in** that the gas bubbles is provided by pumping gas thorough at least one pipe (13) having perforations (20) located mainly below and across the conveyance corridor (10).

13. Method (10) according to claim 11, **characterized in** that the gas used is air.

14. Method (10) according to claim 11, **characterized in** that as physical wall is used a pipeline with walls of fishing net.

15. Method (10) according to claim 11, **characterized in** that frames (12) are positioned at certain intervals along the pipeline to stretch out the wall (11).

16. Method (10) according to claim 15, **characterized in** that as part of the frame (12) a frame tube (13) for gas, the lower half of which being provided with perforations (20), is used.

17. Method (10) according to claim 11, **characterized in** that the fish is initially forced to move by reducing the available volume at the site from which it is to be conveyed.

18. Method (10) according to claim 11, **characterized in** that the fish is motivated to move by additional use of audial sources.

19. Method (10) according to claim 11, **characterized in** that a conveyance corridor (10) being divided into length sections (L) is used, each length section starting with a frame (12) comprising a frame tube (13) arranged to supply gas bubbles to the entire cross-section of the conveyance corridor (10) from a pressurized gas source (18) and ending with a similar frame (12) which starts the next length section of the conveyance corridor (10), valves (17) connecting the gas source (18) to each frame tube (13) being opened sequentially for generating sound that motivates fish in the conveyance corridor (10) to move from one length section (L) to the next length section (L).

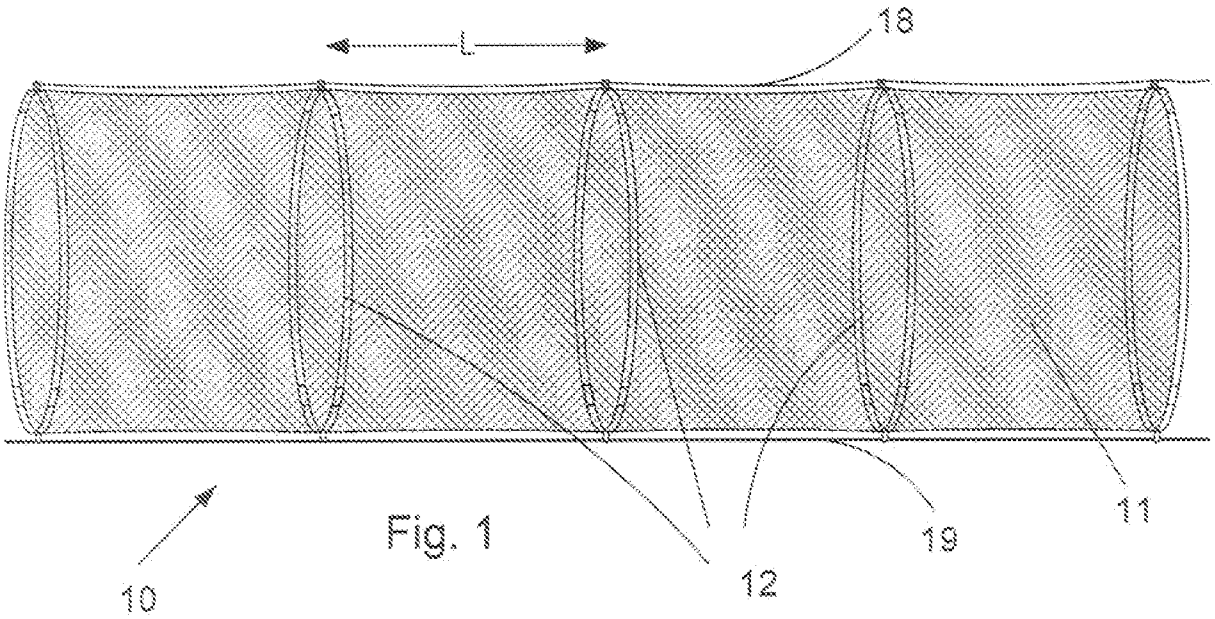

Fig. 1

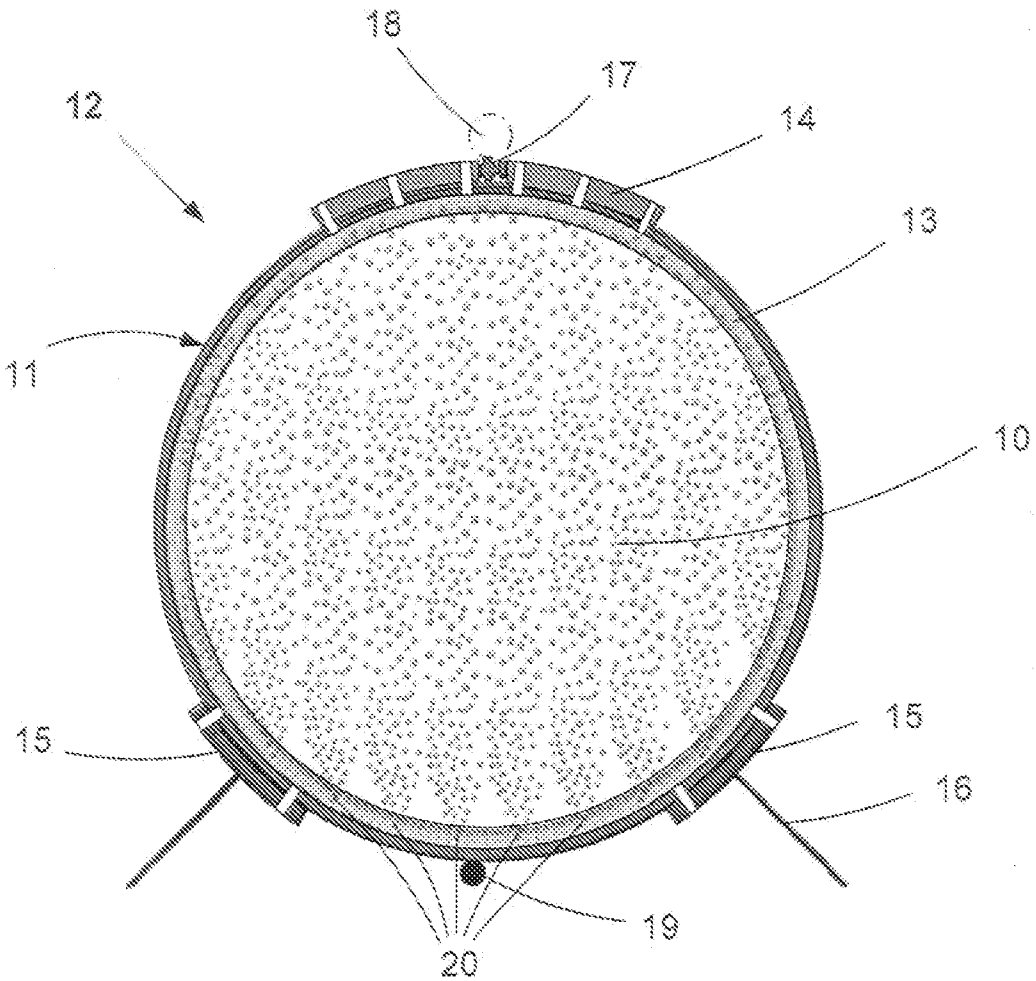

Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO2012/050006

A. CLASSIFICATION OF SUBJECT MATTER

IPC (2006.01) : A01K 61/00, A01K 63/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC (2006.01) : A01K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NO, SE, FI, DK : classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI, AQUASCI, X-FULL (EPOQUE FULL TEXT PATENT),

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 99/40780 A1 (MCROBERT IAN), 19.08.1999 ,page 9, line 1-6, figure 1	1-19
A	GB 1446532 A (FIELD POLYNET LTD C J), 18.08.1976, page 1, line 11-16, figure 4	1-19
A	EP 0202730 A2 (STEADE & SONS LTD H), 26.11.1986, page 2, line 10-13, figure 1	1-19

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT
Information on patent family members

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PUBLICATION Cited in search report	PUB-DATE	PUBLICATION Patent family member	PUB-DATE
WO 99/40780 A1	19.08.1999	US 6216635 B1	17.04.2001
GB 1446532 A	18.08.1976	NONE	
EP 0202730 A2	26.11.1986	GB 2175183 A	26.11.1986