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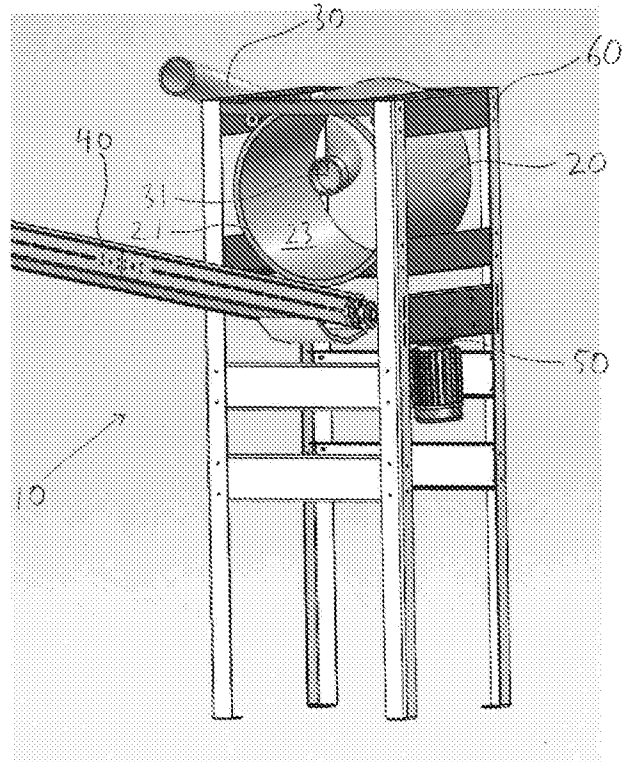
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(71)	Applicant	Lumic AS, Kvernatunvegen 3, 5347 ÅGOTNES, Norge			
(72)	Inventor	Kåre Glesnes, Hytto 12, 5366 MISJE, Norge Hans-Magne Strømme, Skålvikmarka 44, 5357 FJELL, Norge			
(74)	Agent or Attorney	ACAPO AS, Edvard Griegs vei 1, 5059 BERGEN, Norge			

(54) Title **A fish orientation apparatus and a method for orienting fish**

(57) Abstract

The invention relates to a fish orientation apparatus (10), for orienting a dead or sedated fish with its head first in the direction of movement, wherein the apparatus (10) comprises: - a rotatable drum (20), having an outlet end (21) and an inlet end (22), wherein the drum (20) is sloped towards the outlet end (21), - an inlet pipe (30), the inlet pipe (30) is arranged for conveying the fish into the drum (20) from a previous fish processing step, the inlet pipe (30) has a pipe outlet (31), - a water supply arranged to supply water so that fish enters the rotatable drum (20) along with water, and - rotation means (50), arranged for rotating the drum (20). The invention also relates to a method.



TITLE: Improved fish orientation apparatus**Field of the invention**

5 The invention relates to a fish orientation apparatus, for orienting a dead or sedated fish with its head first in the direction of movement. The invention also relates to a method.

Background of the invention

10 In fish farming or in the production of juvenile fish for fish farming, the fish will need to go through various processes for handling and/or treatment, such as vaccination de-licing/delousing etc. Fish which has reached its full size requires to go through several process steps before it ends up in the fridge in the supermarket. Processing of fish include but is not limited to processes such as gutting of dead fish and killing or vaccination of stunned fish.

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Before each of these treatments or process steps, in particular if the processing is automated, it is an advantage that every fish arrives at the process oriented the same way.

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Some of the solutions that mechanically manipulate the fish are not particularly gentle on the fish. This is not good when we are dealing with live fish, and it can also affect the quality and appearance of slaughtered fish.

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For orienting fish various techniques and apparatus's exists. For dead or stunned fish one possible solution is to let the fish slide down a long sloped board. Fish that enter the board with the tail first will in most cases turn and eventually end up with the head first. This however requires a relative long board. The method is also prone to error especially when several fishes enter the board simultaneous they might end up blocking each other from turning. Also, a fish that enters alone, tail first, might not

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There is a need for alternative solutions for directional orientation of fish.

From other technical fields that is remote to fish or foodstuffs handling it is known to orient articles of uniform size and asymmetrical shape. US5353914A for instance discloses a mechanism for orienting articles of uniform size and asymmetrical shape such as T-shaper plastic pipe fittings. US5353914A is from a technical field remot
5 from the technical field of handling and processing fish. The mechanism in US5353914A comprises a rotating hollow tube. This device is however not suitable for use with foodstuffs in general and fish in particular.

Object of the invention

10 An object of the invention is to provide an alternative solution for orienting dead and stunned fish with their head first.

Another objective is to provide a solution for orienting dead and stunned fish head first that is at least one of the following: more efficient, has a lower error rate, takes
15 up less space and/or is gentler on the fish.

Summary of the invention

*In one aspect the invention relates to a fish orientation apparatus, for orienting a dead or sedated fish with its head first in the direction of movement. The apparatus
20 comprises:*

- a rotatable drum, having an outlet end and an inlet end, wherein the drum is sloped towards the outlet end,
- an inlet pipe, the inlet pipe is arranged for conveying the fish into the drum from a previous fish processing step, the inlet pipe has a pipe outlet,
- 25 - a water supply arranged to supply water so that fish enters the rotatable drum along with water, and
- rotation means, arranged for rotating the drum.

To ease the processing of fish, in particular if the processing is automated, it is an
30 advantage that every fish arrives at the process oriented the same way. Processing of fish include but is not limited to processes such as gutting of dead fish and vaccination of sedated fish.

Fish will enter the drum of the fish orientation apparatus after being killed anesthetized/sedated or stunned. Some of the fishes will enter the fish orientation apparatus with their head first and other will enter with their tail first. Fish entering with their head first will simply slide through the drum without any further orientation.

5 Fish entering with the tail first will be turned around so that they exit the drum through the outlet end head first.

The exact reason for the orientation is not easily explained, but trials have shown that if the fish is oriented from tail first to head first almost every time. The rate of error is very low. We believe the orientation happens because a typical fish is 10 heaviest at the head end while the surface of the fish that is in contact with the inner surface of the drum is quite large at the tail. The fish is therefore turned around since the tail somewhat sticks (or has higher friction) to the inner surface of the drum and is therefore pulled a bit up from the low side of the drum by the rotation. While the tail 15 end is pulled to the side by the rotating drum the heavier head end overtakes the tail end. So, the turning process is accelerated by the rotation drum. This is because the tail sticks to the inner surface drum and is therefore pulled to the side up along the inner surface of the drum, so that the heavier head end can slide past the tail end, i.e. the fish is turned. Due to the anatomy of a typical fish, the fish will therefore 20 almost every time be oriented head first out of the drum.

The term drum in this context refers to a cylindrical object and not the musical instrument. The term hollow barrel or pipe could also be used to describe the object referred to as the drum.

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The previous fish processing step can be a handling step. It can be that the fish is moved from a fish tank or fish cage where it was farmed.

The water supply can be a hose from a tap and/or it can be a channel, pipe or similar 30 supplying water (and possibly fish) into a vessel from where the water and fish is led into the inlet pipe.

The pipe outlet can face the outlet end of the drum.

35 *The pipe outlet can be arranged closer to the inlet end of the drum than to the outlet end of the drum.*

The pipe outlet can be arranged slightly into the drum from the inlet side of the drum.

5 *The pipe outlet can be arranged to one side of the axial central axis of the drum. The rotations means can be arranged to rotate the drum in a direction so that a sidewall of the drum moves downwards at the side closes to the pipe outlet.*

10 The pipe outlet is with other words arranged close to the side of the fish orientation apparatus where the sidewall of the drum is moving downwards (the downwards moving side of the drum) due to its intended direction of rotation. This seems to improve the ability to orient the fish.

The fish orientation apparatus can further comprise a conveyor arranged to receive and convey fish exiting the outlet end of the drum.

15 An internal surface of the drum can be slick. The drum can for instance be made of stainless steel or another suitable metal, and the internal surface can be smooth, to allow the fish to easily glide on the internal/inside surface.

20 *The length of the drum can be 1 – 10 times the length of the fish to be oriented, preferably 2 -8 times the length and even more preferred 3 – 5 times the length.*

25 When sizing the drum, some factors should be taken into account, some of these factors may be, but is not limited to: the available space for the drum, the size of the fish to be oriented, required capacity.

30 The fish orientation apparatus can, for example, be used to orient full-grown salmon to the slaughter process or for orienting smaller fish from a hatchery to be vaccinated. The size (length and diameter) of the drum can be optimized for the size of the fish it is intended to be used for, or you can have a drum that works for all sizes, but which may not be optimal either for full-grown salmon or for smolts

35 *The average inner diameter of the drum can be 3-50 times the maximum thickness of the fish to be oriented, preferably 5-30 times the thickness and even more preferred between 8-20 times the thickness.*

The angle of the drum with respect to the horizontal can be 5° - 60° preferably 10° - 45°, even more preferred 10° - 30°.

The angle of the drum relative to the horizontal can be used to optimise the orientation of the fish. Also the combination of said angle and the length and the diameter of the drum can be used to optimise the efficiency and reduce the rate of error.

In another aspect the invention relates to a method for orienting a dead or stunned fish with its head first in the direction of movement. The method comprises the steps of:

- 10 - *providing a fish orientation apparatus, comprising*
 - *a rotatable drum, having an outlet end and an inlet end, wherein the drum is sloped towards the outlet end,*
 - *an inlet pipe, the inlet pipe is arranged for conveying the fish into the drum from a previous fish processing step, the inlet pipe has a pipe outlet, and*
 - 15 - *a water supply arranged to supply water so that fish enters the rotatable drum along with water,*
 - *rotating the drum,*
 - *feeding water and fish into the rotatable drum via the inlet pipe, and*
 - 20 - *turning the fish from tail first to head first.*

The step of providing a fish orientation apparatus can comprise arranging the pipe outlet so that it is facing the outlet end of the drum and arranging the pipe outlet closer to the inlet end of the drum than to the outlet end of the drum.

The step of providing a fish orientation apparatus can comprise the step of arranging the pipe outlet to a side of a axial central axis of the drum, and wherein the step of rotating the drum can comprise rotating the drum in a direction so that a sidewall of the drum moves downwards at the side closes to the pipe outlet.

The step of rotating the drum can comprise to rotate the drum with 5-300 rev/min, preferably 10 – 200 rev/min or more preferred 20 – 150 rev/min.

Description of the diagrams

35 Fig. 1 shows an embodiment of a fish orientation apparatus in a perspective view.

Fig. 2 shows the same embodiment in perspective from another angle.

Fig. 3 shows the same embodiment from the side.

Fig. 4 shows the same embodiment from another side.

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Reference numbers	
1	Arrow indicating the rotation direction of the drum
10	Fish orienting device
20	Drum
21	Outlet end (of drum)
22	Inlet end (of drum)
23	Inside surface of drum (fish turning surface)
30	Inlet pipe (for fish that is not yet oriented)
31	Pipe outlet (of inlet pipe)
40	Fish conveyor (for oriented fish)
50	Motor and gear (for driving the drum)
60	Support structure (for holding and supporting the drum)

Description of preferred embodiments of the invention

In the following an embodiment of fish orientation apparatus 10 will be described with reference to the figures (Fig. 1-4).

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The fish orientation apparatus 10 comprises a rotatable drum 20 arranged in a support structure 60. As seen in Fig. 1 the drum 20 is open in both ends being an outlet end 21 and an inlet end 22, so that there is only a cylindrical sidewall. The drum 20 is oriented lying down in the support structure 60 with a slight angle relative to the horizontal so that outlet end 21 is facing slightly downwards and the inlet end 22 is slightly higher than the outlet end 21.

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An inlet pipe 30 is arranged with a pipe outlet 31 inside the drum 20. Fish will be fed into the drum 20 from a previous process step or storage via the inlet pipe 30. The pipe outlet 31 is arranged inside the drum 20 close to the inlet end 22.

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A water supply is arranged to supply water so that fish and water is entering the drum via the inlet pipe 30. The water supply is not seen in the figures.

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Below the outlet end 21 of the drum 20 a fish conveyor 40 is arranged so that fish that is oriented head first fall down onto the fish conveyor 40 when they exit the drum 20. The fish conveyor 40 will transport the correctly oriented fish (head first) onto the next process step. In this embodiment the fish conveyor 40 is a belt conveyor, but other types of conveyors could also be used.

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Rotation means being motor and gear 50 for driving the drum is arranged below the drum 20 and held by the support structure 60. The motor and gear 50 is seen in all the figures, but most clearly in Fig 3 and 4.

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As seen in all the figures but most clearly in Fig. 3 the pipe outlet 31 is arranged to the side of the centre axis of the drum 20. The pipe outlet 31 is arranged to the side of the drum where the sidewalls due to the rotation of the drum 20 move downwards. With other words: the pipe outlet is arranged to the side of a centre axis of the drum 20, towards the side where a sidewall of the drum 20 is arranged to move downwards from a high side of the drum 20 due to its intended rotational direction. The arrow 1 in Fig. 3 indicates the direction in which the drum 20 is intended to rotate.

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CLAIMS

1. A fish orientation apparatus (10), for orienting a dead or sedated fish with its head first in the direction of movement, wherein the apparatus (10) comprises:
- 5 - a rotatable drum (20), having an outlet end (21) and an inlet end (22), wherein the drum (20) is sloped towards the outlet end (21),
- an inlet pipe (30), the inlet pipe (30) is arranged for conveying the fish into the drum (20) from a previous fish processing step, the inlet pipe (30) has a pipe outlet (31),
- 10 - a water supply arranged to supply water so that fish enters the rotatable drum (20) along with water, and
- rotation means (50), arranged for rotating the drum (20).
2. The fish orientation apparatus (10) according to claim 1, wherein the pipe outlet (31) is facing the outlet end (21) of the drum (20) and wherein the pipe outlet (31) is arranged closer to the inlet end (22) of the drum (20) than to the outlet end (21) of the drum (20).
- 15
3. The fish orientation apparatus (10) according to claim 1 or 2, wherein the pipe outlet (31) is arranged to one side of the axial central axis of the drum (20), and wherein the rotations means (50) is arranged to rotate the drum (20) in a direction (1) so that a sidewall of the drum (20) moves downwards at the side closes to the pipe outlet (31).
- 20
4. The fish orientation apparatus (10) according to any of the preceding claims, wherein the fish orientation apparatus (10) further comprises a conveyor (40) arranged to receive and convey fish exiting the outlet end (21) of the drum (20).
- 25
5. The fish orientation apparatus (10) according to any of the preceding claims, wherein the length of the drum (20) is 1 - 10 times the length of the fish to be oriented, preferably 2 - 8 times the length and even more preferred 3 – 5 times the length.
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6. The fish orientation apparatus (10) according to any of the preceding claims, wherein the average inner diameter of the drum (20) is 3-50 times the maximum thickness of the fish to be oriented, preferably 5-30 times the thickness and even more preferred between 8-20 times the thickness.
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7. The fish orientation apparatus (10) according to any of the preceding claims, wherein the angle of the drum (20) with respect to the horizontal is 5° - 60° preferably 10° - 45° , even more preferred 10° - 30° .

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8. A method for orienting a dead or stunned fish with its head first in the direction of movement, wherein the method comprises the steps of:

- providing a fish orientation apparatus (10), comprising

- a rotatable drum (20), having an outlet end (21) and an inlet end (22), wherein the drum (20) is sloped towards the outlet end (21),

10

- an inlet pipe (30), the inlet pipe (30) is arranged for conveying the fish into the drum (20) from a previous fish processing step, the inlet pipe (30) has a pipe outlet (31), and

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- a water supply arranged to supply water so that fish enters the rotatable drum (20) along with water,

- rotating the drum (20),

- feeding water and fish into the rotatable drum (20) via the inlet pipe (30), and

- turning the fish from tail first to head first.

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9. The method according to claim 8, wherein the step of providing a fish orientation apparatus (10) comprises arranging the pipe outlet (31) so that it is facing the outlet end (21) of the drum (20) and arranging the pipe outlet (31) closer to the inlet end (22) of the drum (20) than to the outlet end (21) of the drum (20).

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10. The method according to claim 8 or 9, wherein the step of providing a fish orientation apparatus comprises the step of arranging the pipe outlet (31) to a side of a axial central axis of the drum (20), and wherein the step of rotating the drum (20) comprises rotating the drum (20) in a direction (1) so that a sidewall of the drum (20) moves downwards at the side closes to the pipe outlet (31).

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11. The method according to any of the claims 8 - 10, wherein the step of rotating the drum (20) comprises to rotate the drum with 5-300 rev/min, preferably 10 – 200 rev/min or more preferred 20 – 150 rev/min.

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Fig. 1

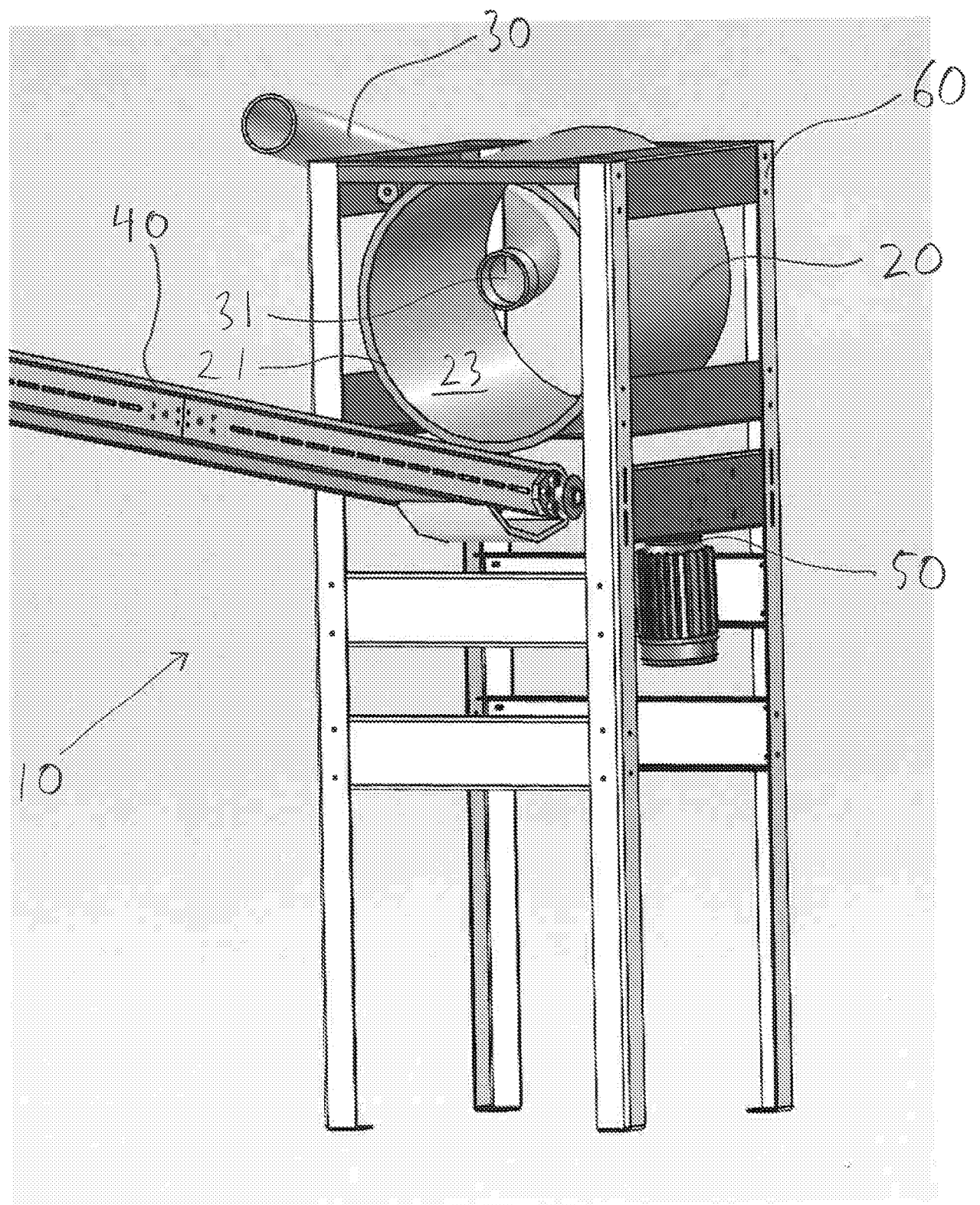


Fig. 2

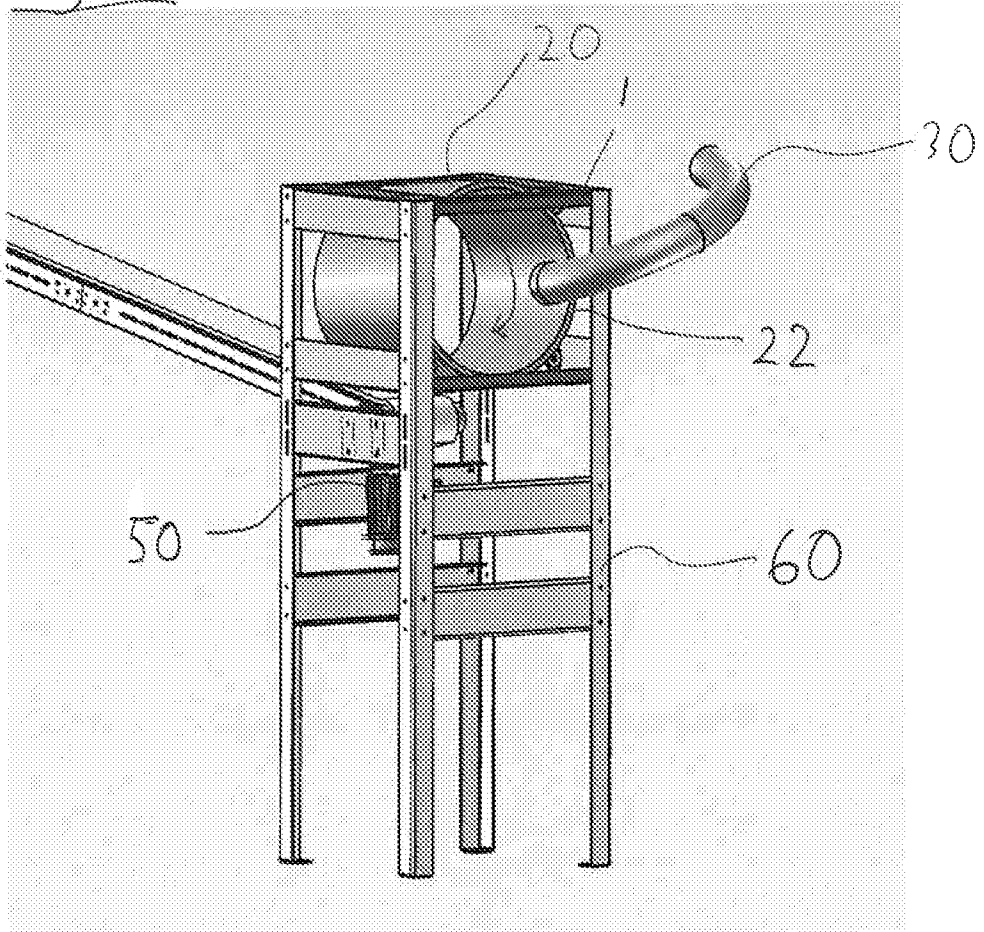


Fig. 3

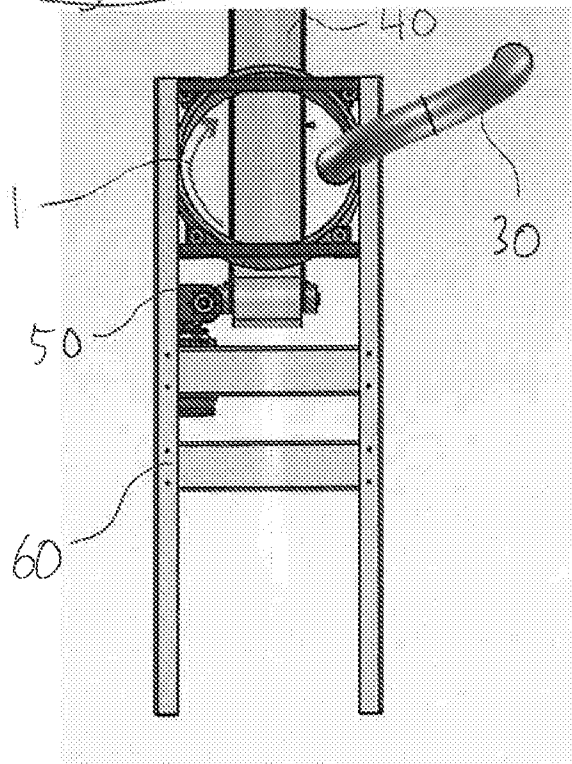


Fig. 4

