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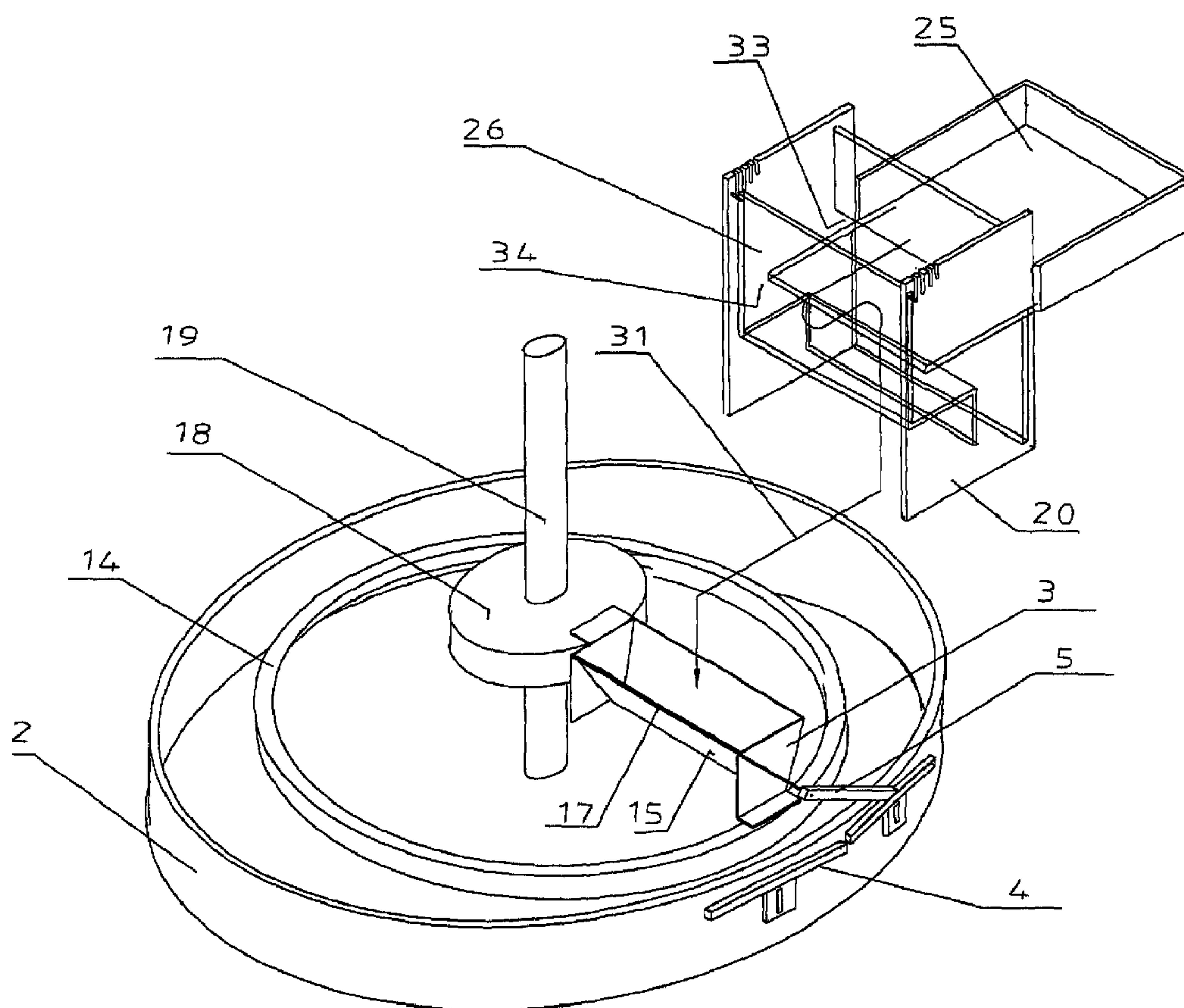
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(54) Title: APPARATUS FOR GRADING LIVE FISH AND THE LIKE



(57) Abrégé/Abstract:

The present invention relates to an apparatus for grading live fish and the like. It comprises an in-feed device capable of feeding a maximum number of fish into a grading box which revolves. As it revolves, a slot opens in the bottom. The slot grows progressively

(57) **Abrégé(suite)/Abstract(continued):**

broader during the revolution, or half revolution if there are two in-feed positions. Successively bigger fish will pass the slot into bins for different size fish.

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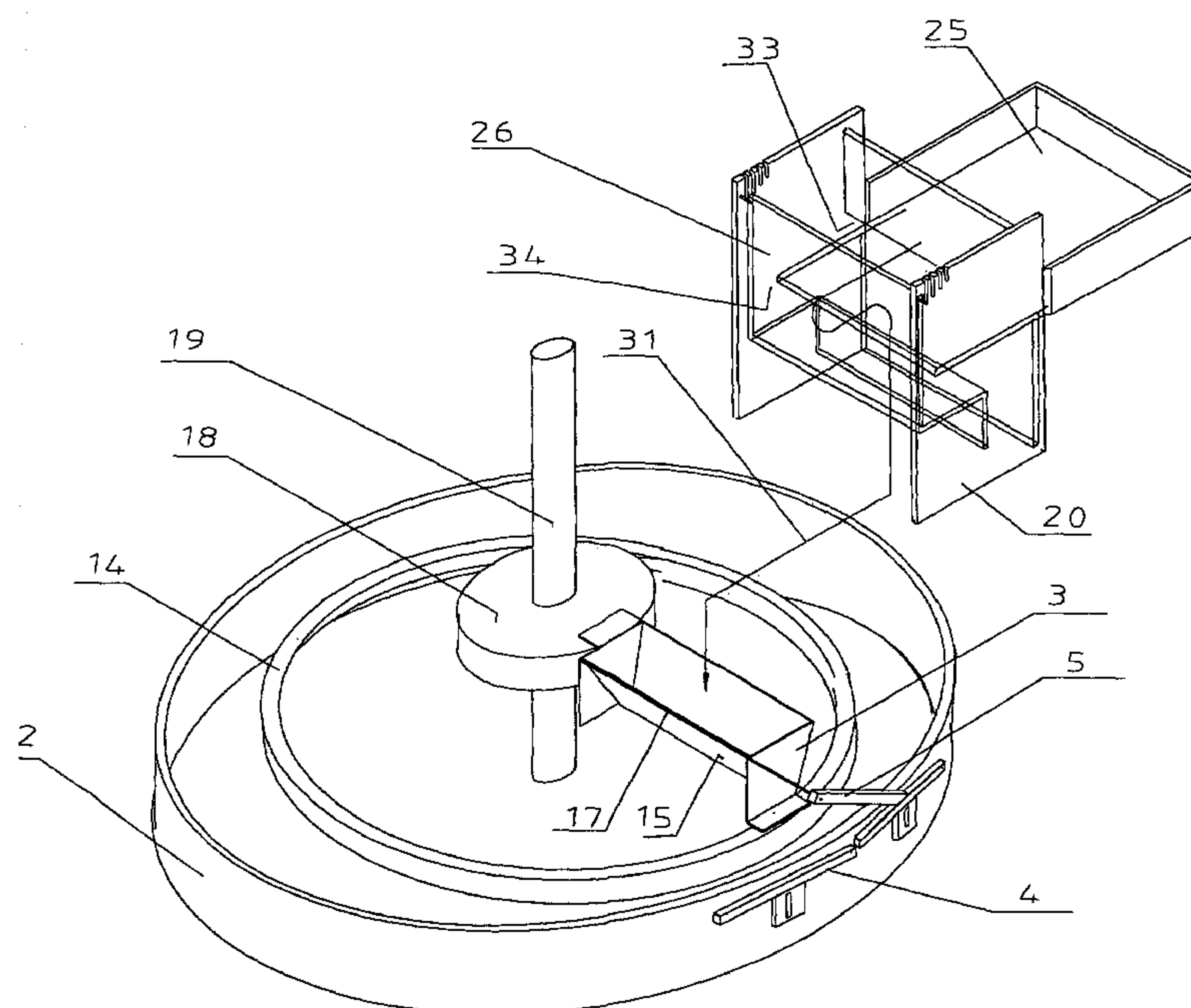
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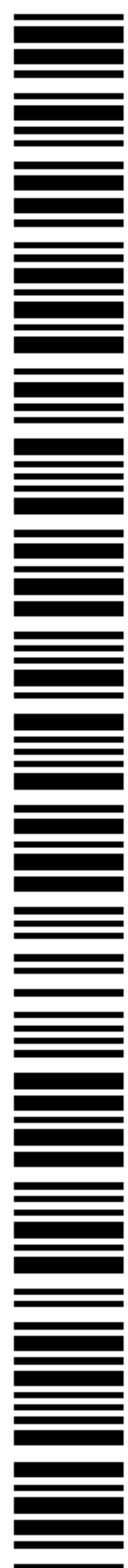
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(54) Title: APPARATUS FOR GRADING LIVE FISH AND THE LIKE



(57) Abstract: The present invention relates to an apparatus for grading live fish and the like. It comprises an in-feed device capable of feeding a maximum number of fish into a grading box which revolves. As it revolves, a slot opens in the bottom. The slot grows progressively broader during the revolution, or half revolution if there are two in-feed positions. Successively bigger fish will pass the slot into bins for different size fish.



WO 03/059052 A1

APPARATUS FOR GRADING LIVE FISH AND THE LIKE

The invention concerns a method and equipment for grading according to thickness sensitive objects, particularly live fish, smolt and fry, but also other organic and non organic material, which may involve more gentle and accurate treatment.

The machinery and equipment involved is based on the assessment of the thickness of the objects, and is unique in that processing is based on specially-designed box equipment, which preferably holds and moves the objects forwards without shaking them or rubbing their surface in the course of grading. The equipment includes special boxes with one movable side, adjustment device, drive equipment, infeed equipment and the co-ordination of functioning of all these elements in order to achieve the desired aims.

Many types and versions of grading machines for fish and other materials are known which grade the items according to an assessment of their thickness. These include machines with belts or rollers and shaker-graders with several grading channels. Ridge-belt machines also have several grading channels formed of ridgebelt. All the machines have grading channels that are wider at the outlet than at the intake. The belt machine draws the objects forward between two inclined belts which form the channel. The roller machines include two rollers which turn, the items being moved slowly past the rollers by means of friction between the rollers and the objects. The shaker-grader consists of ridges which form gaps, the objects are moved forward between the ridges by shaking. The ridge-belts machine has belts which move the object as a belt conveyor when the gap increases the object falls through.

One type of machine which involves a rotating table is a vaccination apparatus, United States Patent 5,215,035. On the table are mounted some holders for the fish to be vaccinated. The machine has a basin where fish are placed under an anaesthetic to make it easy to manually transfer them from the basin in to the machine. If the fish is non-breeding the operator can push a contact on the machine which then will direct the fish to a different outlet.

In addition to the aforementioned grading machines, there are machines which operate in accordance with different principles and are fitted with electronic scales or imaging sensors.

An aim is to provide a box-grading-machine which treats the items to be graded gently, is accurate for living fish, smolt, fry and other organic material and is also able to grade non organic material and is constructed so that it is compact and does not need much working area, is relatively inexpensive and requires little maintenance.

The present invention provides an apparatus for grading sensitive products such as living fish, smolt and fry, comprising an infeed device, boxes for moving and grading the products and devices to control the grading slot, each box is made up of two parts a support-part and an adjustable part, the support-part has one side and two end plates which are bolted to the rotation table and rotate with the central shaft, the adjustable part is a second side of the box and hangs on a pin which is placed in bearings on the support-part of the box and on the end of the pin is a lever arm which is in contact with an adjusting device, the width of the grading slot is controlled by several adjustable guide ways, one guide way for every outlet from the grader when the guide way is lifted the grading slot gets narrower. when the guide way is lowered the width of the grading slot increases.

The infeed device utilizes the natural behaviour of live fish on flat plate which cause the fish to glide on the sloping bottom plate to the slots. The first slot is to ensure that only single layer of fish will be in the spreader part of the in feeding device, the second slot control the flow of fish and orients the fish in a position which is suitable for good grading. The first part of the infeeding device is a receiver with slightly sloping bottom so the fish glide to the first control slot and further to the second slot in the feeding spreader which places the fish in the correct position for grading and in the grading boxes. The fish is lifted up to the receiver either with a dipnet or by pumping.

The machine has a revolving plane to which the grading boxes are fastened and rotate with the central shaft. The outlets are placed in the machine frame under the revolving plane. When the material is to be graded in a few sizes only for instance four sorts the outlets from only half of the machine are needed and then is possible to infeed on two places at the same time and increase the throughput of the machine.

Preferred embodiments of the invention will now be described, by way of example only, and with reference to the accompanying drawings in which:

Figure 1 - shows a side view of the equipment designed for grading of live fish, smolt, fry and other objects.

Figure 2 - shows a top view of the equipment.

Figure 3 - shows a grading box with movable side.

Figure 4 - shows a infeeding device.

Figure 5 - shows an overview drawing which elaborates on how the different devices work together.

Figure 1

Shows a side-view of the machine. The machine is build on a machine frame (1). In the centre of the frame is pilar bracket (21) and on the top of the pilar is a bearing (13) for the supporting axle (19) and the bracket plate (18), the grading boxes (3) are bolted to the bracket plate and rotate with it. On the top of the supporting axle is a gear wheel (8) which is driven by a motor and pinion wheel (9)

The material to be graded is lifted up to the infeeder device (25) and glides through the first slot (24) to the spreader and falls through the second slot (20) to the grading box (3) in a suitable quantity. The adjusting arm (5) is fastened to a pivot (17) which is joined to the movable side (15) of the grading box (3) the adjusting arm (5) glides on an adjusting rim (4), the width of the grading gap depends on how high the adjusting rim is placed, the adjusting rim is moved up or down by the adjusting screw (6) which is placed in a bracket (23) on the bracket holder (22). Every outlet from the machine has it own adjusting rim which controls the size of the outgoing material, the graded material falls through the gap in the grading box and down a chute (2) to a suitable container.

Figure 2

Shows a top-view of the machine. The items (20), (24) and (25) are on a higher level than the other parts of the drawing. In the middle is the driving shaft (19), the bracket plate (18) is fastened to the shaft and the rotating table (16) and the grading boxes (3) are bolted to the bracket plate. The opposite end of the grading boxes slides on a bearing surface (14). The adjustable side (15) of the grading box is affixed to the pin (17) and the adjusting arm (5) which slides on the adjusting rim (4). Plates (16) cover the gaps between the grading boxes and make up the bottom in the movable part of the machine which is surrounded by bulwarks on the outer side (10) and on the inner side (11).

Figure 3

Shows a grading box and the box parts. The fixed part (3) is bolted to the rotating part of the machine, the movable side (15) is connected to the fixed part through the pivot (17). At the bottom of the grading box is a gap where the material falls through and is sorted by size depending on how wide the gap is. The adjusting arm (5) controls the size of the gap when the arm is lifted or lowered the movable side (15) is turned about the pivot (17)

Figure 4.

Shows a in feeding device which are made from three main parts of which the first is the infeeding receiver (25) with sloping bottom (32) so the fish glide to the slot (33) because of the ordinary movement of live fish. The second main part is the spreader and flow control (20). Between the receiver and the spreader is a control plate (35) which adjust the slot (33) The third main part is the flow control board (26). Between the flow control board and one end of the bottom plate (32) is an adjustable slot (34). The flow control board (34) hangs on taps (27) in slots (30) thus making it possible to control the width of the slot (34) and the width of the canal which leads to the grading box. With use of the adjusting screw (29) and the braced (28) the slot (34) can be finely adjusted. The arrow (31) shows the way the fish glide from the receiver to the grading box. The plate (24) prevent the fish from moving in the wrong direction on the rotating table.

Figure 5

This picture details the workings of the grading system. The grading box (3) and the adjustable box side (15) are the part of the machine where the grading is done. The material is brought into the infeeder (25) and glides trough a slot (33) to the spreader and falls through second slot (34) down to the grading boxes (3). The flow is adjusted with the control panel (26) and the control slots (30) where the control panel is placed. The arrow shows the way the material flows. The movable box side is connected to the pivot (17) which is fastened to an adjusting arm (5). The adjusting arm glides on an adjusting rim (4) and regulates the grading slot at the bottom of the grading box. When the adjusting rim (4) is lifted, the slot narrows, but if the adjusting rim is lowered the slot width increases. The grading boxes are bolted to a bracket dish (18) which rotates together with a central shaft (19).

Claims

1. Apparatus for grading sensitive product such as living fish, smolt and fry, comprising an infeed device, revolving plane and outgoing channels below the revolving plane, a drive mechanism and water supply characterised in grading boxes wherein one of a box side is adjustable and forms a grading gap in a bottom of the box and the gap is controlled from an adjusting arm which glides from one adjusting rim to another and adjusts the grading gap, the grading box moves together with the revolving plane, a bracket holder surrounds the revolving plane and is fastened to a machine frame and the adjusting rims are connected to the bracket holder and are lifted or lowered to decrease or increase the grading gap and below the revolving plane are outgoing channels, when material is only graded in a few sizes infeed to the apparatus can be at two or more places.
2. Apparatus as claimed in claim 1, characterised in that the infeed device comprises a receiver with a slightly sloping flat bottom and an adjustable slot which controls that only single layer of fish is fed to a spreader part with an adjuster board and a second slot which regulates the flow and is controlled by a control board which also helps to bring the fish into a favourable grading position.
3. Apparatus as claimed in claim 1 and 2, characterised in that the revolving plane rotates the grading boxes around a central shaft thereby causing the gaps in the grading boxes to adjust so the assorted size of material falls out in a right outgoing channel.
4. Apparatus as claimed in claim 1 to 3, characterised in that the grading is carried out in boxes which are placed in the revolving plane, with one side of every box movable so it is possible to vary the width of the slot at the bottom of each box, the movable side is at the top fastened to a pivot with the adjusting arm on an end which controls the width of the grading gap.
5. Apparatus as claimed in claim 1 to 4, characterised in that the grading slot at the bottom of the grading boxes is adjusted when the adjusting arm glides over

the adjusting rims which control the size of the material going to each of the outgoing channels, the adjusting rims being set in position with adjusting screws which are fastened to the surrounding bracket holder.

6. An apparatus for grading sensitive products such as living fish, smolt and fry, comprising:

one or more in-feed devices;

a water supply for providing a water flow with the products through the apparatus;

a drive mechanism for providing rotary motion within the apparatus;

and

a revolving plane with attached grading boxes for receiving the products from the one or more in-feed devices, the revolving plane being provided with outgoing channels there below,

wherein the graded products are released through the bottom of the grading boxes to the outgoing channels positioned underneath the revolving plane, the outgoing channels being fastened to the machine frame,

wherein one of the sides of the grading boxes is adjustable and forms a grading gap in the bottom of the boxes, the gap being controlled by a lever arm, the arm being operative to glide on a piecewise adjustable grading rim which controls the grading gap,

wherein the grading rim is attached to a bracket holder forming an assembly which surrounds the revolving plane and is fastened to a machine frame, and

wherein the position of each piece of the grading rim is adjusted to control the gap in the bottom of the grading boxes.

7. The apparatus of claim 6, wherein at least one of the one or more in-feed devices comprises:

a receiver with a slightly sloping flat bottom;

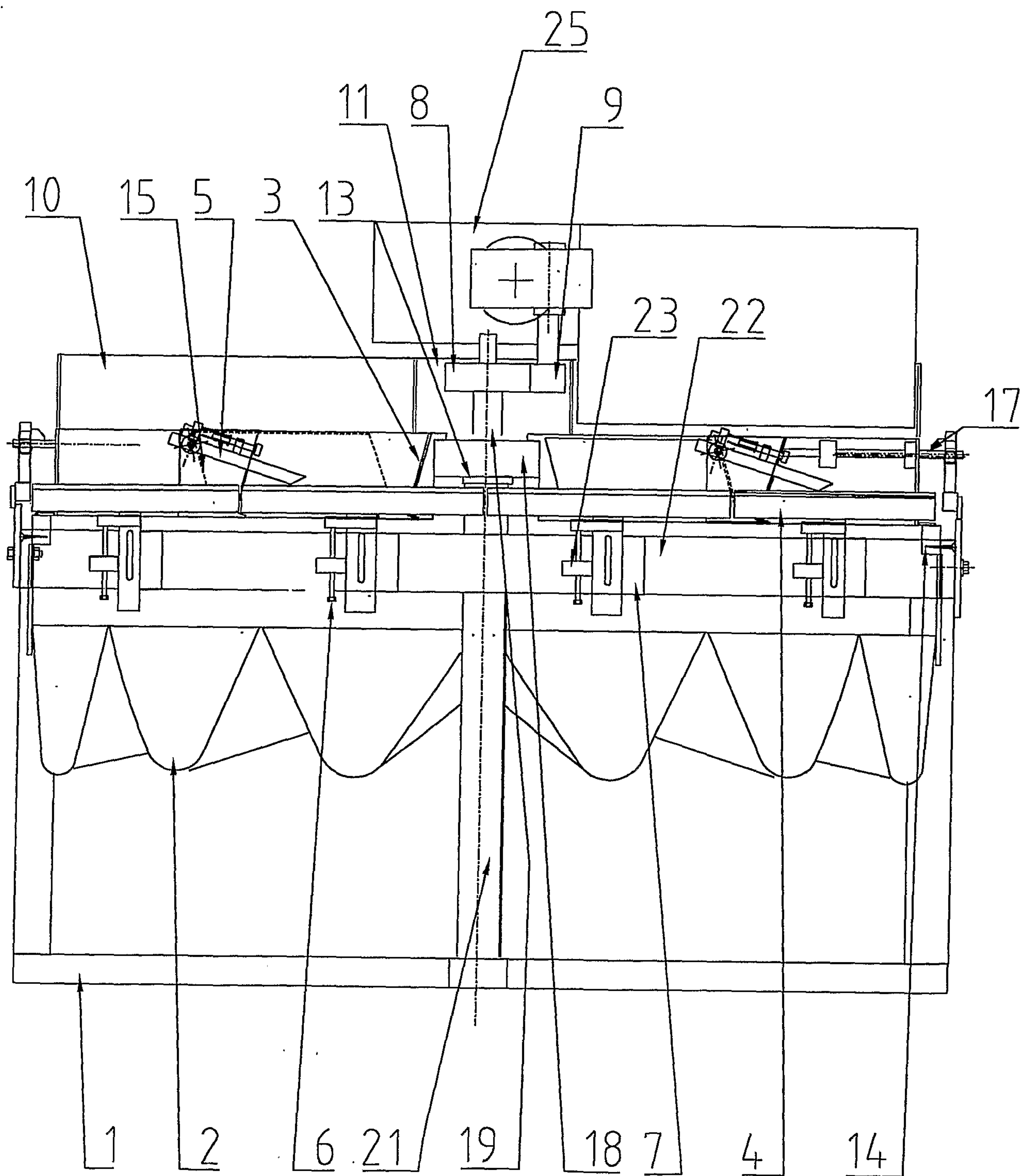
an adjustable slot for controlling that only a single layer of fish is fed to a spreader part provided with an associated adjuster board; and

a second slot which regulates the flow of fish and is controlled by a control board which is also operable to bring the fish into a favorable grading position.

8. The apparatus of claim 6 or 7, wherein the grading device comprises:
 - a revolving plane, rotating the grading boxes around a central shaft;
 - and
 - a stationary frame with an adjustable piecewise grading rim,
 - wherein each piece of the grading rim is adjustable and the grading rim adjusts the gap in the bottom of the grading boxes so the products in the boxes fall out into corresponding selected outgoing channels.
9. The apparatus of any one of claims 6 to 8, wherein grading of the products is carried out in boxes, which are attached to the revolving plane with one side of every box movable for varying the width of the slot at the bottom of each box, wherein the top edge of the movable side is fastened to a pivot with a lever arm, and wherein an end of the lever arm glides on the grading rim thereby controlling the width of the grading gap.
10. The apparatus of any one of claims 6 to 9, wherein the grading device comprises a piecewise adjustable grading rim assembly surrounding the revolving plane, the assembly being arranged to operate the grading slot at the bottom of the grading boxes by means of the lever arm gliding on the piecewise adjustable grading rim, wherein the piecewise adjustable grading rim controls the size of the products directed to each of the outgoing channels, the pieces of the grading rim being set in position with adjusting screws which are fastened to the surrounding bracket holder.

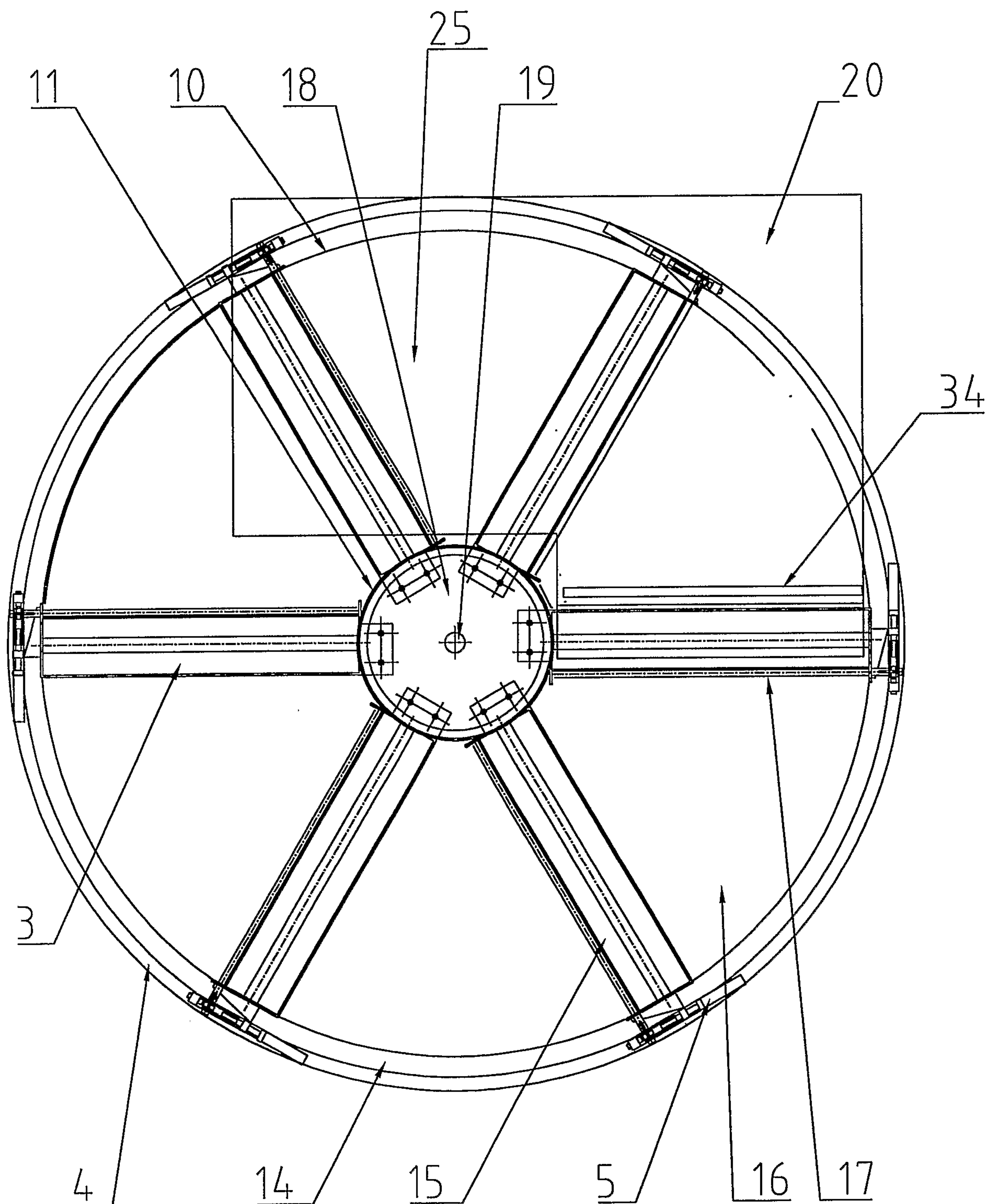
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FIG 1



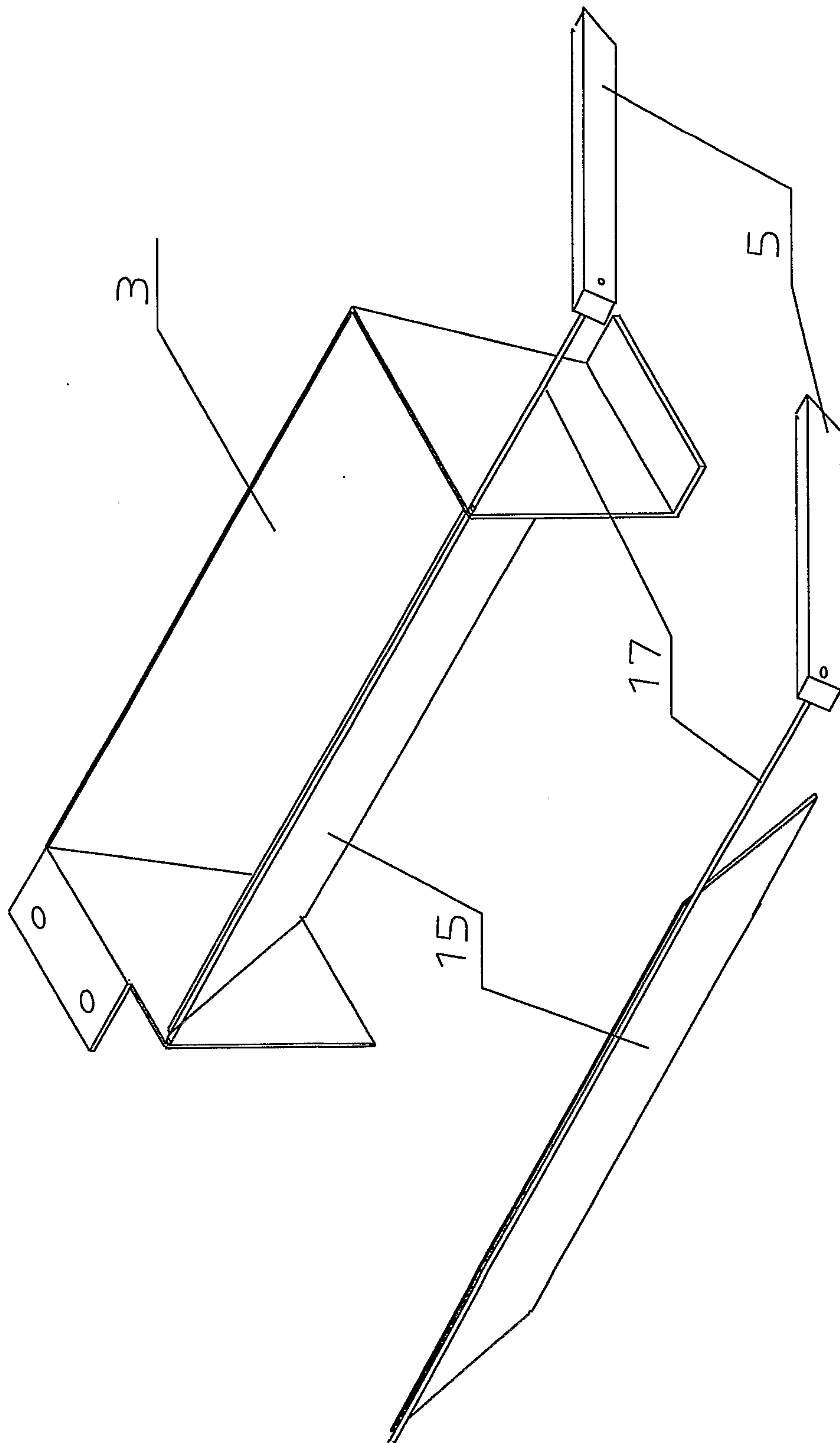
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FIG 2



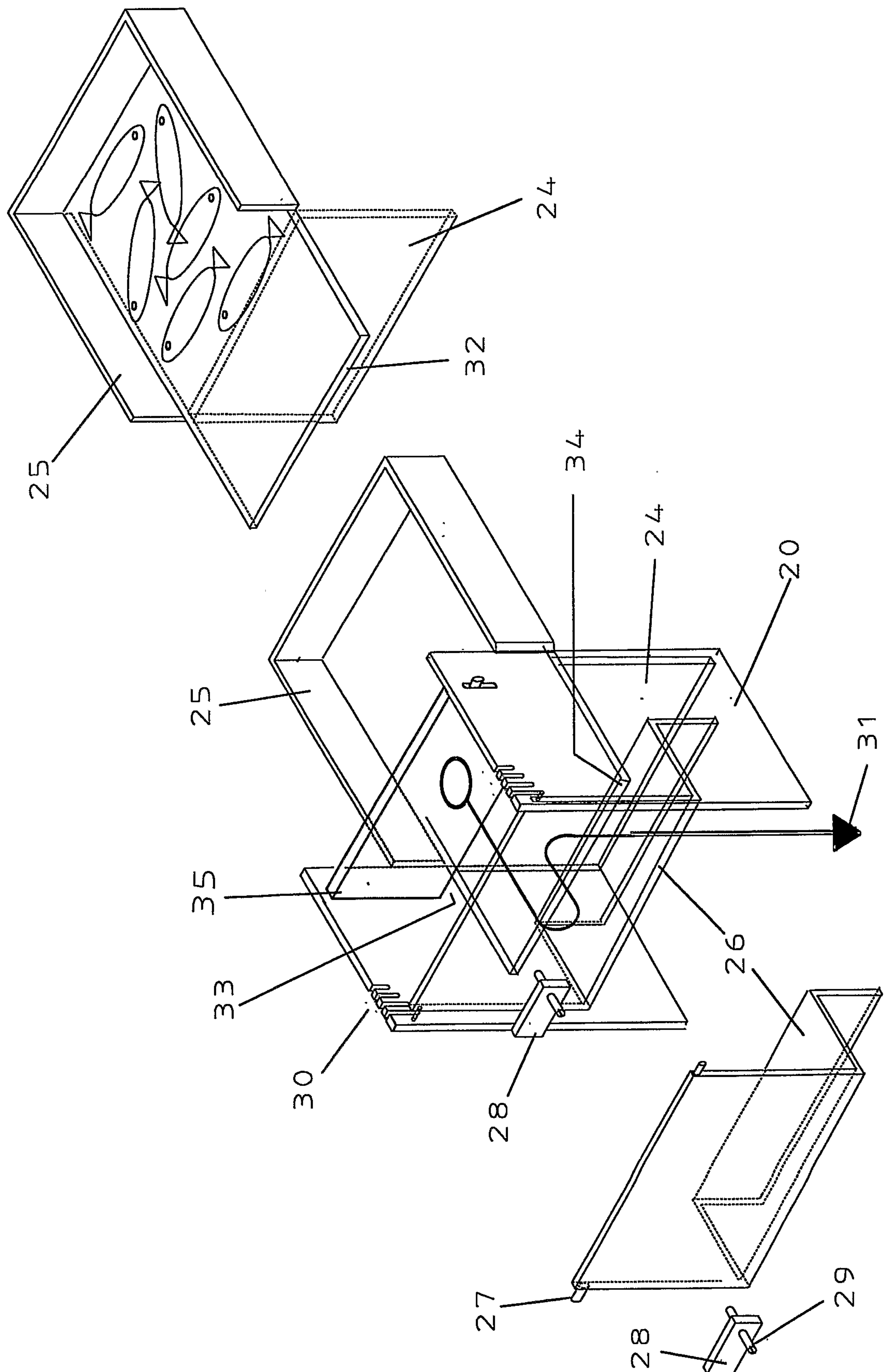
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FIG 3



4/5

FIG 4



5/5

FIG 5

