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(54) Method of and apparatus for aligning fish

(57) To enable the mechanical processing of fish a high percentage of which may have damaged heads, the fish are placed in troughs 6, 7 of a conveyor transverse to their longitudinal axes and in the course of being conveyed in the troughs are brought into contact with the circumferential surface 17 of a driven rotational body 14 moved to swing in the axial direction of the fish. The head of each fish thus enters the wedge formed between a support surface 6 of the conveyor and the circumferential surface of the rotational body so that the circumferential surface comes into contact with the head flank of the fish and pushes the fish backwards in the respective trough as the body (14) swings in that direction. The swinging movement of the body is limited by a thickness sensing element 22, 24 operatively coupled to the body and sensing the thickness of the rearwardly moving fish.

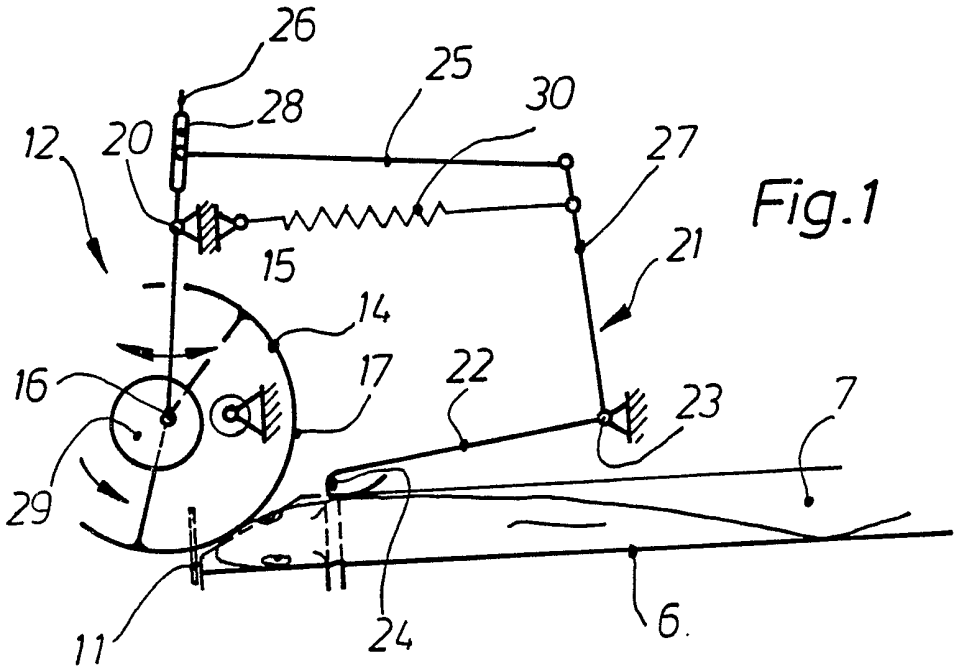

Fig.1

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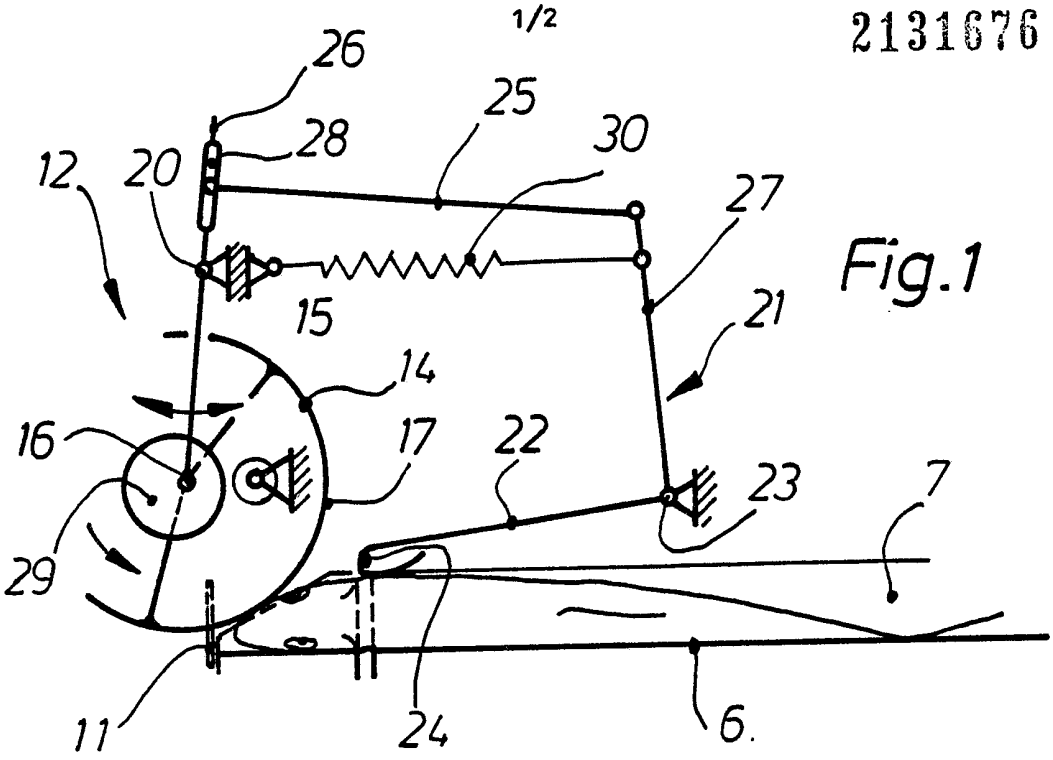

Fig.1

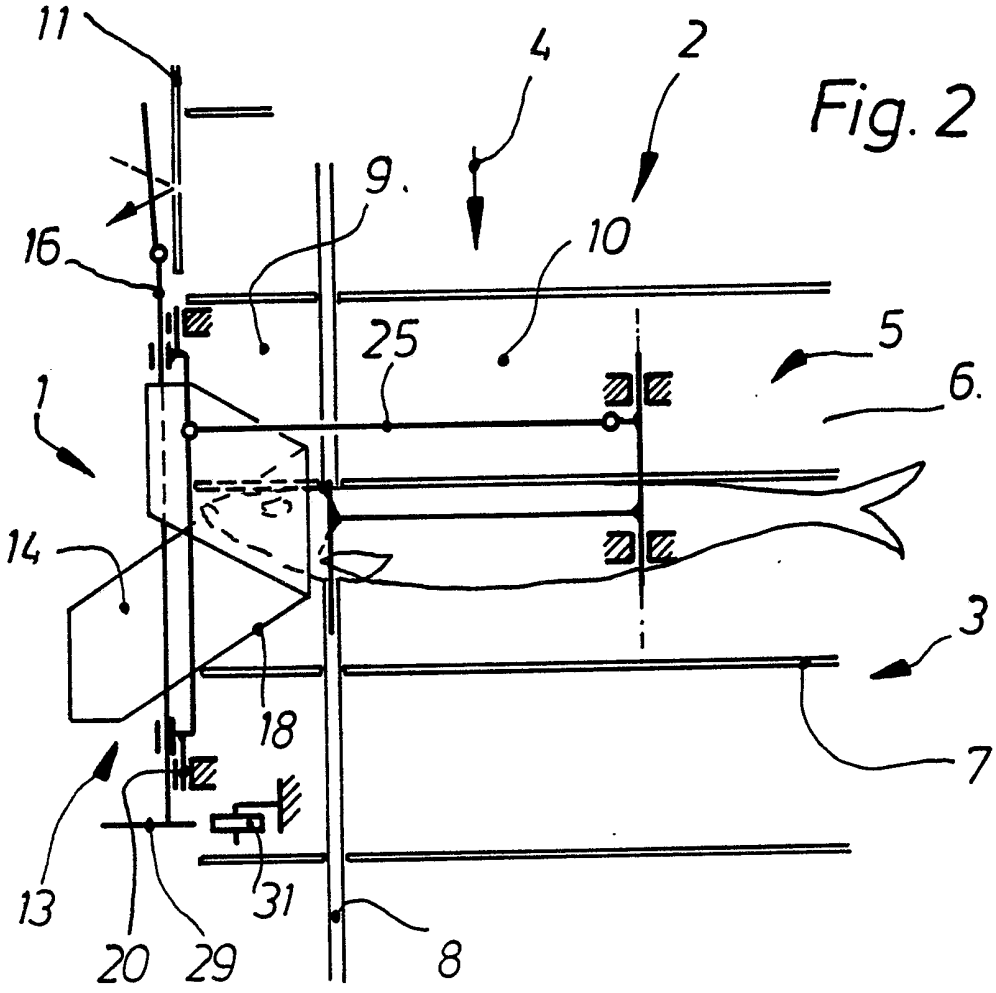

Fig. 2

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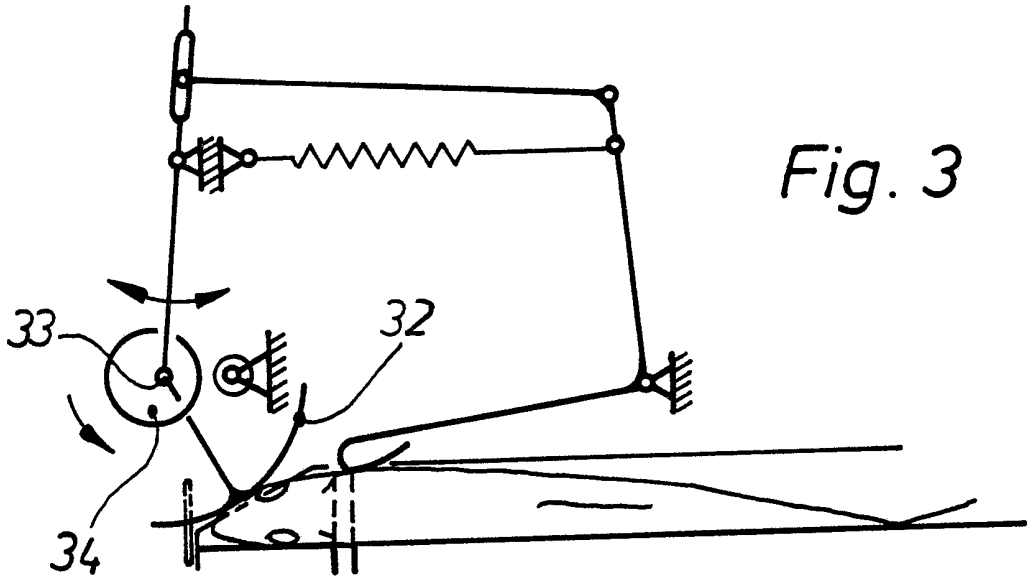

Fig. 3

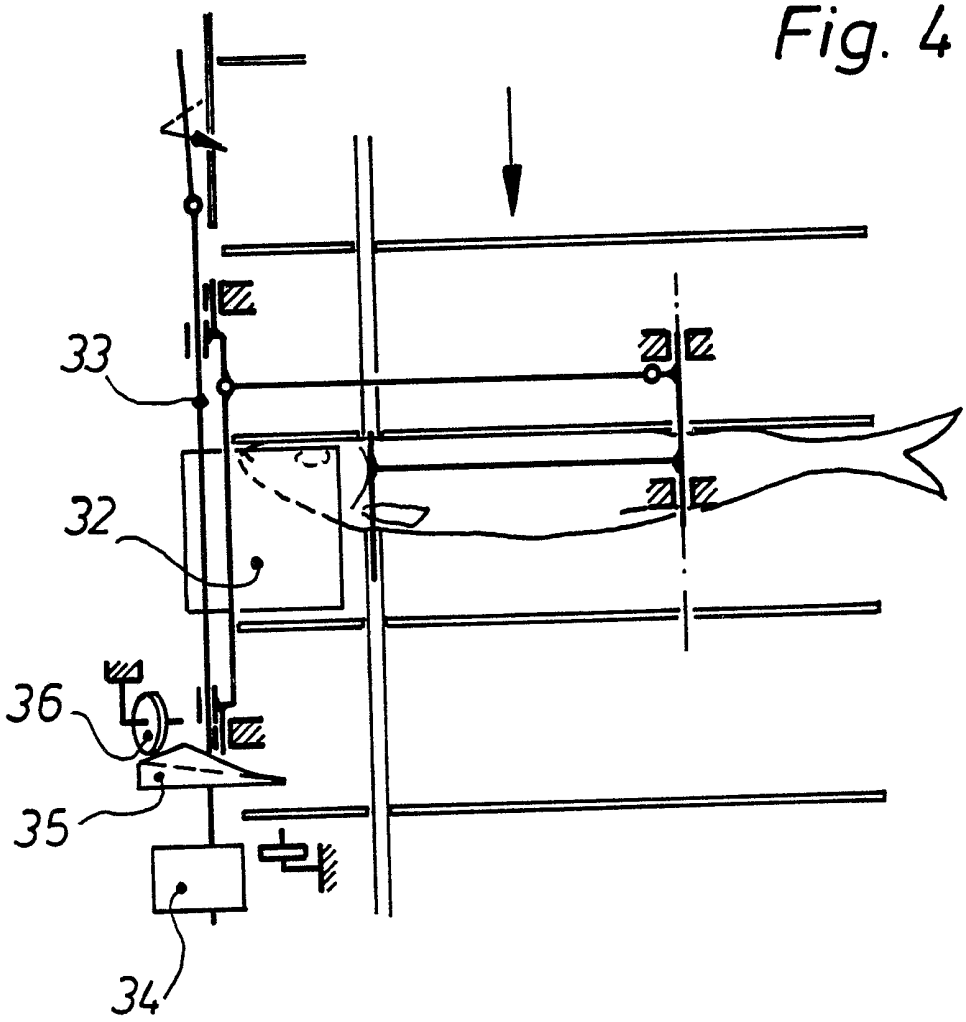

Fig. 4

SPECIFICATION

Method of and apparatus for aligning fish

The invention relates to a method of aligning fish and to apparatus for carrying out such method.

In commercial fishing, set or stationary nets and drift nets are being used more and more frequently in view of increasing costs, especially in the area of energy supply. Besides the improvement in the economy of these catching methods, another advantage which comes into being is that these nets effect a better selection of size in contrast to trawl or draw nets. This is due to the fact that in a set net or a drift net the only fish retained are those which are caught with their gill covers in the net mesh due to their size, while smaller fish can swim through without hinderance. In contrast thereto it is unavoidable with a trawl net that the exit for smaller fish is closed with increasing filling of the net, since the bodies of the fish already caught lie across and obstruct the mesh openings.

By contrast to the advantages of set and drift nets, which prove helpful to endeavours to ensure the continued existence of the fish species forming the basis of human nutrition with fish protein, there is the fact that a relatively large number of fish thus caught are damaged at their heads. The reason for this is that the fish, after such nets have been hauled in, must be picked or shaken out of the mesh, the result of which is that the gills and sometimes also the lower jaws are torn off. Fish so damaged cannot be processed mechanically in a conventional way since usually the measuring and adjusting means of processing machines start in the area of the head in order to adjust the position of each fish optimally, for example for beheading.

Such means are disclosed in, for example, German (Fed. Rep.) Patent specification 26 19 217. This device shows a trough conveyor conveying the fish to be processed transverse to their longitudinal axis. An aligning plate is arranged beside the trough conveyor and running with the same and is equipped with head pressers which engage at the head end of the fish and yield resiliently. The speeds are so co-ordinated that the head pressers accompany the fish and effect a displacement of the same. A brake shoe which can be lowered onto each fish, via an operational coupling with the aligning plate, according to the timing of the troughs is moved in such a way that the displacement movement of a large fish is stopped earlier and that of a small fish, later. The co-ordination in this is such that each fish, independent of its size, takes a position which enables an economical beheading cut.

Further, a device is disclosed in DE—OS 31 11 507 in which conveyed fish placed belly-down in troughs of an intermittently driven trough conveyor are adjusted into an optimal beheading position independent of their size. The device consist of a feeler which can be lowered onto the back of the fish during the stationary period of the trough conveyor, which feeler is in operational relationship with a pushing element engaging the head end of the fish. The operation relationship is such that the positioning by displacement is ended when the feeler comes into contact with the back of the fish.

The exact positioning of fish damaged at their heads is not possible with the prior art devices. Since the afore-mentioned damage occurs with a certain uniformity, it is possible to co-pordinate the known device accordingly. It is not, however, possible to account for the fact that damaged as well as undamaged fish reach processing randomly.

There is therefore a need for a method of mechanical processing without sorting of the catch, of fish caught in drift or set nets.

According to a first aspect of the present invention there is provided a method of aligning fish with respect to the position of the edges of their gill covers or their shoulder girdle arcs facing the rump, the method comprising the step of displacing the fish into an aligned position by engaging at least one of the head flanks of each fish.

According to a second aspect of the present invention there is provided fish aligning apparatus for carrying out the method according to the first aspect of the invention, comprising a conveyor to convey fish in a direction transverse to their longitudinal axes in conveying chambers defined by a support surface for the fish and by chamber separating elements extending transversely to the conveying direction, and a displacing device operable to displace the fish within the chambers and comprising a displacing element movable between the separating elements in time with movement of the chambers past the displacing device and a braking element engageable with the flank of each fish and operatively coupled to the displacing element, the displacing element comprising a body of revolution drivable to rotate about a first axis which extends substantially parallel to the conveying direction and which is arranged at a swinging arm pivotable about a second axis substantially parallel to the first axis, and a circumferential surface of the body being arranged closely above the support surface and to move against each fish.

Preferably, a cam disc advantageously running equiaxed with the body of revolution can be provided for timing the displacing device, which cam disc bears against a supporting roller by the force of a spring. An adaptation of the displacing device to each fish to be processed can be enabled in an advantageous manner in that the operative relationship between the displacing element and the brake element is formed by a lever mechanism, the lever ratio of which is adjustable.

In the case of apparatus with a continuously driven conveyor, the circumferential surface of the body of revolution or rotational body may be formed cylindrically and in the form of a helix having a pitch or gradient corresponding to the pitch or spacing of the conveying chambers of the conveyor and having a width which, measured

parallel to the first axis, is smaller than the width of the support surface of the fish in the conveying chambers, and the revolutions of the body of revolution or rotational body corresponding to the pulse or timing of the conveying chambers moved by the conveyor.

Alternatively, the body of revolution or rotational body may comprise a cylinder segment, on the rotation of which is superimposed a reversing axial movement such that the cylinder segment, during the phase of its penetration between the separating elements of the conveying chambers, undergoes a displacement corresponding to the advance of the chambers.

An example of the method and an embodiment of the apparatus will now be more particularly described with reference to the accompanying drawings, in which:

Fig. 1 is a schematic side view of first apparatus embodying the invention;

Fig. 2 is a schematic plan view of the apparatus of Fig. 1;

Fig. 3 is a schematic side view of second apparatus embodying the invention; and

Fig. 4 is a schematic plan view of the apparatus of Fig. 3.

Referring now to the drawings, there is shown fish processing apparatus, for example a decapitating and filletting machine, with a processing station 1, a feeding area 2 positioned in front thereof, and a conveyor 3 driven endlessly in the direction of arrow 4. The conveyor 3 has conveying chambers 5 which are limited by limiting walls 7 extending upwardly from a support surface 6. Both the support surface 6 and the walls 7 are provided with a slot 8 which extends parallel to the drive direction of the conveyor and divides each chamber 5 into a head chamber 9 and a rump chamber 10 with a ratio of about one to four. In the feeding area 2, the head chambers 9 are covered frontally by a head bar 11 attached to the machine. Preferably the support surfaces 6 are arranged to ascend slightly from the head bar 11 in order to create a certain component of gravity of the fish in the direction towards the head bar 11.

The processing station 1 comprises a displacement device 12 and, for example, a cutting device (not shown) which serves for removing the heads of fish and which penetrates the slot 8. The displacement device 12 is arranged above the conveyor 3, i.e. the support surface 6. It comprises essentially a displacing element 13 which is formed in a suitable manner as a body of revolution or rotational body 14 driven in a timed manner with the conveying chambers 5 moved by the conveyor 3. The body 14 rotates about a first axis 16 arranged parallel to the conveying direction of the conveyor 3 and at a swinging or oscillating crank 15. According to the embodiment of Figs. 1 and 2, the body 14 comprises a helix 18 which forms part of a cylindrical circumferential surface 17 having a pitch or gradient corresponding to the spacing of the conveying chambers 5 and a width, i.e. the respective surface width of the helix elements, which when measured parallel to the first axis 16 is smaller than the width of the support surface 6 in the chambers 5. The crank 15 is formed as a double-armed lever mounted pivotally about a second axis 20, which is arranged approximately above the front side end of the head chambers 9 and parallel to the arrow 4. The crank 15 is operatively coupled to a brake element 21. This comprises a sensing lever 22 formed as an angle lever which is mounted pivotally about an axis 23 arranged at the machine above the rump chambers 10 parallel to the conveying direction 4. A sensing plate 24 provided with a sensing edge is positioned at the end of that arm of the sensing lever 22 which extends above the rump chambers 10, the plate being positioned in the plane of the slot 8. The operative coupling of the displacing element 13 and the brake element 21 is effected by means of a lever 25 which pivotably connects a free arm 26 of the double-armed lever forming the crank 15 to a free arm 27 of the sensing lever 22. The lever ratio of the lever mechanism is adjustable by an oblong hole attachment 28 on the arm 27.

A cam disc 29 is arranged on the first axis 16 of the rotational body 14, rotates therewith and is drawn by the force of a spring 30 against a supporting roller 31 attached to the machine.

A variation of the displacement device 12 as shown in Figs. 3 and 4 provides a cylinder segment 32 as a rotational body, which segment rotates about an axis 33 corresponding to the first axis 16. The axis 33 carries an axial cam 35 as well as a cam roller 34 corresponding to the cam disc 29, which axial cam is held by the force of an axial spring (not shown) against a supporting roller 36.

The method of operation of the device is as follows:

Fish to be processed arrive either manually or by corresponding feeding devices between the lateral limiting walls 7 of the conveying chambers 5 in such a manner that the heads in the head chambers 9 come to rest against the head bar 11. The fish are supplied to the displacement device 12 so that they can each enter its area when the largest radius portion of the cam disc 29 bears on the roller 31. During further conveying, the circumferential surface 17 of the body 14 approaches the fish due to the course of the cam disc 29 on the roller 31 and finally gets into contact with the head flank of the fish, which is present in the form of the skull even when the gill cover and the lower jaw have been torn off. Due to the rotating movement of the helix 18 forming the circumferential surface 17 of the body 14, the surface 17 accompanies the fish with which it is in contact and pushes it back in the respective conveying chamber 5 due to the increasing course of the cam disc 29. This process continues until the sensing lever 22 connected to the crank 15 via the lever 25 contacts the fish with the edge of its sensing plate 24. If the lever ratio of the lever mechanism has been adjusted properly then this occurs when the edge of the gill cover or the edge

of the shoulder girdle has come to rest directly next to the edge of the sensing plate 24. The pushing process is ended when the latter touches the fish so that the cam disc 29 and the roller 31 get out of contact. In this way the fish is aligned in a position which enables economical beheading.

In the displacement device 12 of Figs. 3 and 4 the accompanying movement of the circumferential surface 17 of the rotational body which gets in contact with the fish is effected by the movement of course of the axial cam 35. This enables design of the rotational body as a cylinder segment 32 which penetrates between the limiting walls 7. The cam roller 34 controlling the crank 15 is so synchronised with the axial cam 35 that the cylinder segment 35 is guided back against the conveying direction of the conveyor 3 when the segment 32 is outside the chambers 5.

The advantages achieved by such a method and apparatus include an improvement in the reliability of the process for treating fish damaged at their heads and of respective processing machines which have a high throughput rate, thus obtaining an improvement in the processing economy as a whole.

CLAIMS

1. A method of aligning fish with respect to the position of the edges of their gill covers or their shoulder girdle arcs facing the rump, the method comprising the step of displacing the fish into an aligned position by engaging at least one of the head flanks of each fish.

2. A method substantially as hereinbefore described with reference to Figs. 1 and 2 of the accompanying drawings.

3. A method substantially as hereinbefore described with reference to Figs. 3 and 4 of the accompanying drawings.

4. Fish aligning apparatus for carrying out the method claimed in claim 1, comprising a conveyor to convey fish in a direction transverse to their longitudinal axes in conveying chambers defined by a support surface for the fish and by chamber separating elements extending transversely to the conveying direction, and a displacing device operable to displace the fish within the chambers and comprising a displacing element movable between the separating elements in time with movement of the chambers past the displacing device and a braking element engageable with the flank of each fish and operatively coupled to the displacing element, the displacing element comprising a body of revolution drivable to rotate about a first axis which extends substantially parallel to the conveying direction and which is arranged at a swinging arm pivotable about a second axis substantially parallel to the first axis, and a circumferential surface of the body being arranged closely above the support surface and to move against each fish.

5. Apparatus as claimed in claim 4, comprising a cam disc so rotatable about the first axis and resiliently urged against a supporting roller as to effect said timed movement of the displacing element.

6. Apparatus as claimed in either claim 4 or claim 5, wherein the braking element is operatively coupled to the displacing element by a lever mechanism and means for adjusting the leverage ratio of the mechanism.

7. Apparatus as claimed in any one of claims 4 to 6, wherein the circumferential surface has the form of a helix with a pitch corresponding to the pitch of the chambers, the width of the circumferential surface in a direction parallel to the first axis being smaller than the width of the portion of the support surface in each chamber and the body being drivable to rotate at a speed corresponding to the speed of movement of the chambers.

8. Apparatus as claimed in any one of claims 4 to 6, wherein the body comprises a circularly arcuate member so axially movable during movement between the separating elements as to move with the chambers in the conveying direction.

9. Apparatus substantially as hereinbefore described with reference to Figs. 1 and 2 of the accompanying drawings.

10. Apparatus substantially as hereinbefore described with reference to Figs. 3 and 4 of the accompanying drawings.

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