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(54) Titre : DISPOSITIF D'EVISCERATION ET PROCEDE D'EVISCERATION DE POISSONS
(54) Title: GUTTING DEVICE AND METHOD FOR GUTTING FISH

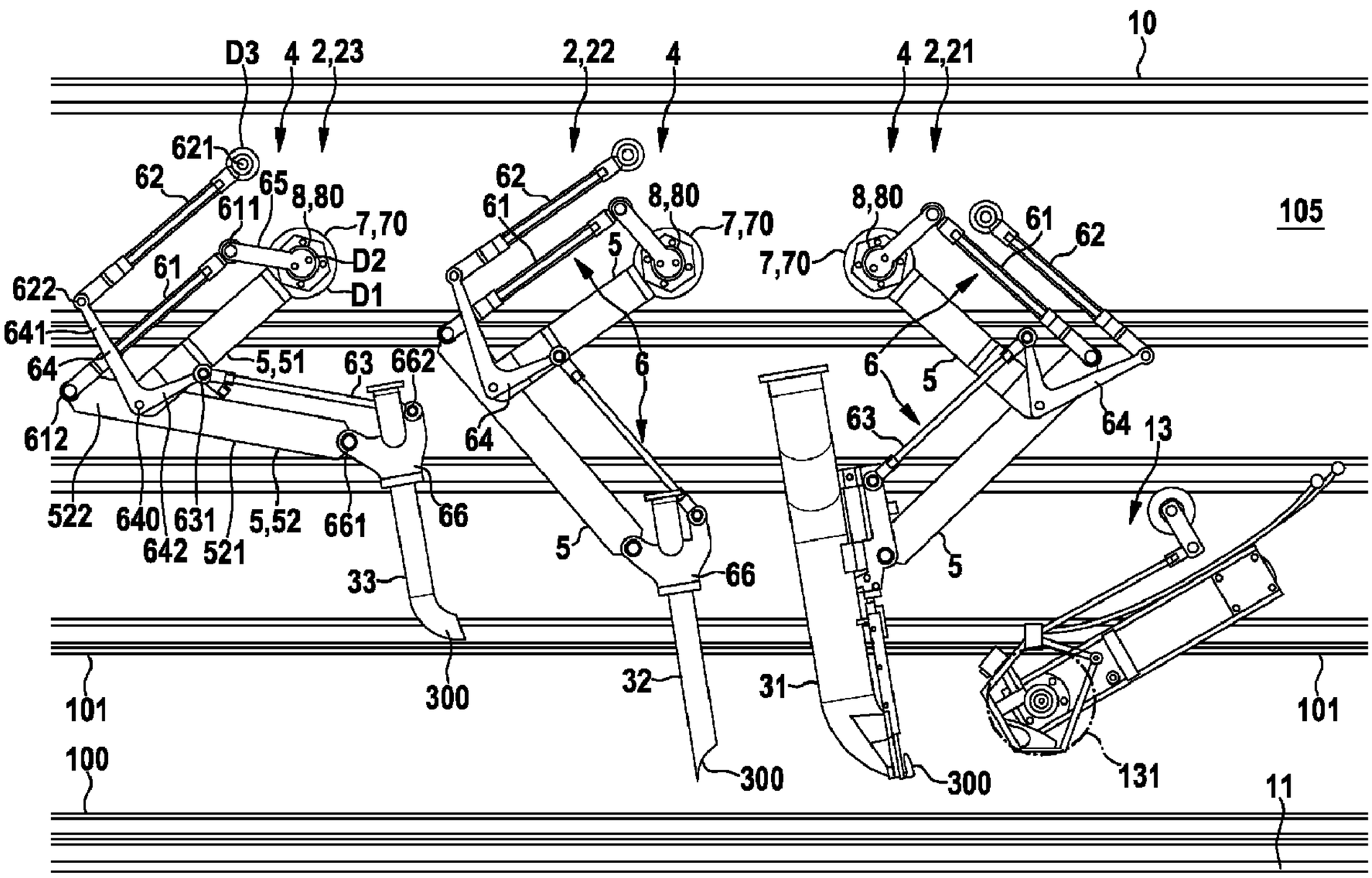

Fig. 2

(57) Abrégé/Abstract:
Disclosed is a gutting device (1) for gutting fish (9), said device having gutting tools (3) arranged above a processing line (100), which gutting tools can be controlled into and out of the opened abdominal cavity (93) of each fish which is conveyable in a supine

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(57) Abrégé(suite)/Abstract(continued):
position and a longitudinal orientation. A computer-operated device controller (15) is designed to control in accordance with the fish conveying speed, fish data detected by means of a fish measuring device (12), and tool contact with fish parts in the abdominal cavity (93). Each gutting tool (3) is suspended by means of a rocker system (4). This rocker system has a drive rocker (5, 51), a tool rocker (5, 52) that hinges on the gutting tool (3) and a steering linkage (6) by means of which the angular positions between the rockers (5) and between the gutting tool (3) and the tool rocker (52) can be continuously controlled. The drive rocker (51) is pivotally hinged about a rocker drive axis (70) by means of a rocker pivot drive (7) that is controlled by the device controller (15). The steering linkage (6) is connected to the device controller (15) by means of a steering pivot drive (8) that controls the steering linkage. The device controller (15) and the rocker systems (4) controlled thereby are designed such that, by means thereof, the gutting tools (3) for processing the fish (9) can be simultaneously moved in a conveying direction (F). A method for gutting fish in particular by means of the stated gutting device (1) consists in that all the gutting tools (3), when in the position in the abdominal cavity (93), are moved in the fish conveying direction (F) with the fish (9) to be machined at tool speeds which are less than, equal to or greater than the fish conveying speed.

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Erklärungen gemäß Regel 4.17:

— *hinsichtlich der Berechtigung des Anmelders, ein Patent zu beantragen und zu erhalten (Regel 4.17 Ziffer ii)*

— *Erfindererklärung (Regel 4.17 Ziffer iv)*

[Fortsetzung auf der nächsten Seite]

(54) **Title**: GUTTING DEVICE AND METHOD FOR GUTTING FISH

(54) **Bezeichnung** : ENTWEIDE-EINRICHTUNG SOWIE VERFAHREN ZUM ENTWEIDEN VON FISCHEN

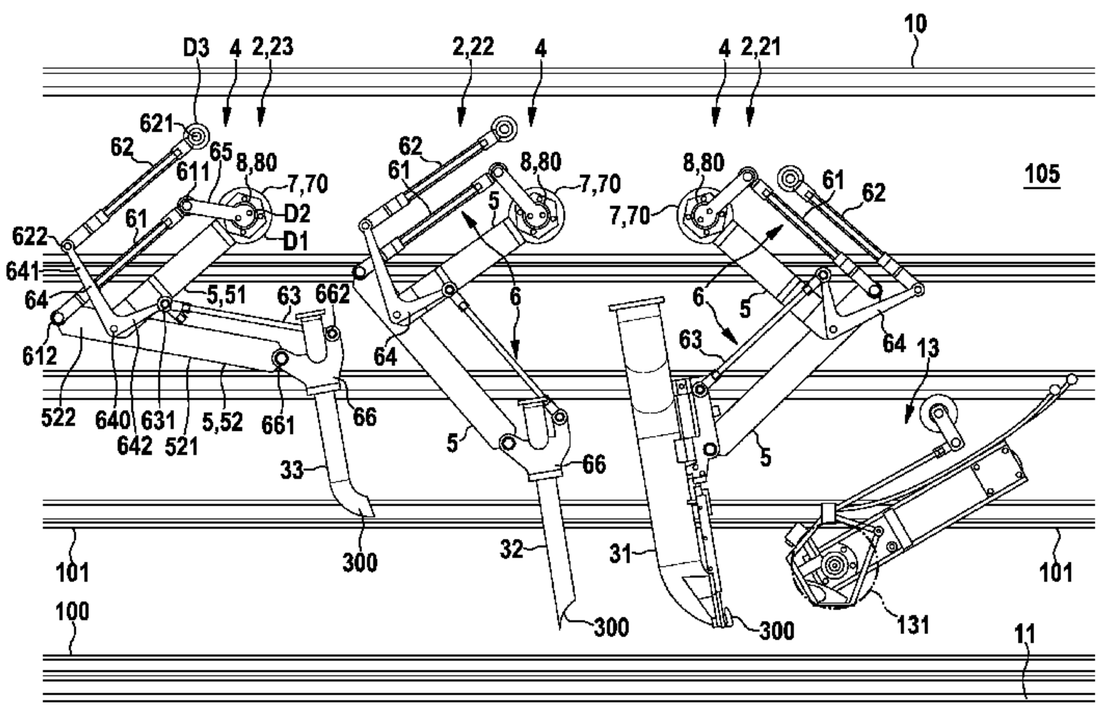

Fig. 2

(57) **Abstract**: Disclosed is a gutting device (1) for gutting fish (9), said device having gutting tools (3) arranged above a processing line (100), which gutting tools can be controlled into and out of the opened abdominal cavity (93) of each fish which is conveyable in a supine position and a longitudinal orientation. A computer-operated device controller (15) is designed to control in accordance with the fish conveying speed, fish data detected by means of a fish measuring device (12), and tool contact with fish parts in the abdominal cavity (93). Each gutting tool (3) is suspended by means of a rocker system (4). This rocker system has a drive rocker (5, 51), a tool rocker (5, 52) that hinges on the gutting tool (3) and a steering linkage (6) by means of which the angular positions between the rockers (5) and between the gutting tool (3) and the tool rocker (52) can be continuously controlled. The drive rocker (51) is pivotally hinged about a rocker drive axis (70) by means of a rocker pivot drive (7) that is controlled by the device controller (15). The steering linkage (6) is connected to the device controller (15) by means of a steering pivot drive (8) that controls the steering linkage. The device controller (15) and the rocker systems (4) controlled thereby are designed such that, by means thereof, the gutting tools (3) for processing the fish (9) can be simultaneously moved in a conveying direction (F). A method for gutting fish in particular

[Fortsetzung auf der nächsten Seite]

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— *mit internationalem Recherchenbericht (Artikel 21 Absatz 3)*

by means of the stated gutting device (1) consists in that all the gutting tools (3), when in the position in the abdominal cavity (93), are moved in the fish conveying direction (F) with the fish (9) to be machined at tool speeds which are less than, equal to or greater than the fish conveying speed.

(57) Zusammenfassung: Eine Entweide-Einrichtung (1) zum Entweiden von Fischen (9) weist oberhalb einer Bearbeitungslinie (100) angeordnete Entweidewerkzeuge (3) auf, die in die geöffnete Bauchhöhle (93) jedes in Rückenlage und Längsausrichtung förderbaren Fisches hinein und heraus steuerbar sind. Eine rechnerbetriebene Einrichtungs-Steuereinrichtung (15) ist zur Steuerung in Abhängigkeit von der Fisch-Fördergeschwindigkeit, von mittels einer Fisch-Messeinrichtung (12) erfassten Fischdaten und von Werkzeug-Kontakt mit Fischteilen in der Bauchhöhle (93) eingerichtet. Jedes Entweidewerkzeug (3) ist über ein Schwingen-System (4) aufgehängt. Dieses weist eine Antriebs-Schwinge (5, 51), eine das Entweidewerkzeug (3) anlenkende Werkzeug-Schwinge (5, 52) und ein Lenkgestänge (6) auf, durch das Winkelstellungen zwischen den Schwingen (5) sowie zwischen dem Entweidewerkzeug (3) und der Werkzeug-Schwinge (52) stufenlos steuerbar sind. Die Antriebs-Schwinge (51) wird mittels eines von der Einrichtungs-Steuereinrichtung (15) gesteuerten Schwingen-Schwenkantriebs (7) um eine Schwingen-Antriebsachse (70) schwenkbar angelenkt. Das Lenkgestänge (6) ist mit einem es steuernden Lenk-Schwenkantrieb (8) mit der Einrichtungs-Steuereinrichtung (15) verbunden. Die Einrichtungs-Steuereinrichtung (15) und die damit gesteuerten Schwingen-Systeme (4) sind derart eingerichtet, dass die Entweide-Werkzeuge (3) zum Bear-beiten der Fische (9) mit diesen in Förderrichtung (F) mitlaufend bewegbar sind. Ein Verfahren zum Entweiden von Fischen insbesondere mit der genannten Entweide-Einrichtung (1) besteht darin, dass sämtliche Entweidewerkzeuge (3) während ihrer Position in der Bauchhöhle (93) in Fisch-Förderrichtung (F) mit dem zu bearbeitenden Fisch (9) mit Werkzeuggeschwindigkeiten bewegt werden, die kleiner, gleich oder größer als die Fisch-Fördergeschwindigkeit sind.

Gutting device and method for gutting fish

The invention relates to a gutting device for gutting fish, comprising a conveyor for conveying the fish along a processing line in a supine position and a longitudinal orientation, a fish measuring device for detecting specific fish data, an abdominal opening apparatus and processing means arranged above the processing line for removing the internal organs, consisting of gutting tools arranged one behind the other which can be controlled into and out of the opened abdominal cavity, each gutting tool being suspended by means of an associated tool rocker controllable in its pivot position via two rocker pivot axes which both lie transverse to a vertical plane and to the conveying direction, and a computer-operated device controller, by means of which the controlled insertion, controlled retraction and processing paths of the gutting tools are controllable, dependent on the fish conveying speed, the detected specific fish data and tool contact with fish parts to be processed in the abdominal cavity. The invention also relates to a method for gutting fish which are conveyed along a processing line in a supine position and a longitudinal orientation, specific fish data being detected by means of a fish measuring device, the abdomen first being opened and then the abdominal cavity being cleared and cleaned with a plurality of gutting tools arranged one behind the other along the processing line, the movements of the gutting tools being controlled dependent on control variables, namely on the measured fish data, on processing contact with fish parts in the abdominal cavity and on the fish conveying speed. All the gutting tools (3) during their positions in the abdominal cavity (93) are moved in a co-running manner with the fish to be processed (9) in the fish conveying direction (F) dependent on the processing position and the processing operation, wherein the co-running movements are carried out at tool speeds which are less than, equal to or greater than the fish conveying speed.

A device and a method for gutting fish, in particular salmon, are known from DE 198 29 376 A1. Reference is made to DE 198 29 376 A1 for the basic design and function of the generic gutting device. Each fish conveyed supine and tail-first is processed by a plurality of tools one after another during its transport. Three gutting tools are provided, the tool heads of which are formed by scrapers, raspers or knives with suction nozzles.

Gutting tools, such as are known from DE 198 29 376 A1, are arranged at stationary points along a conveying path and are only adjustable in height position in relation to the conveying path. A known mounting system consists in that each of the three said gutting tools is attached to a crank rocker mounted pivotably on the device housing, said crank rocker being formed by a pivotable lever. The known crank rocker is so long that, on pivoting about the pivot axis on which the crank rocker is stationarily suspended, the gutting tool is essentially moved vertically. Each of the three said gutting tools has only a limited field of movement. On moving the gutting tool into its operating area (working area), a movement essentially perpendicular to the fish conveying direction is performed. The gutting tool then remains largely stationary in relation to a horizontal movement in the conveying direction, the central bone of the fish to be processed being followed by relative movement of the gutting tool in relation to the fish conveyed. In order to pivot the gutting tool out of the fish body without collision, the gutting tool is pivotably hinged to the said crank rocker, wherein only two pivot positions are obtained controllably for assuming an operative position in the abdominal cavity and a waiting position above the fish. Pivoting out promptly in order to prevent collision shortens the time the gutting tool stays in the gullet area. On the whole, the immobility or limited mobility of the gutting tool with respect to horizontal movements means that a holding time and a processing time of the gutting tool are dependent on the length of the fish and the abdominal cavity in such a manner that the residence time of the gutting tool in the fish is limited. The gutting and cleaning result thus remains unsatisfactory. A longer residence time requires a reduction in the conveying speed of the fish. This is counter to the objective of gutting as many fish as possible per hour.

A gutting tool disclosed known from DE 198 29 376 A1 can be controlled in height when being lowered against a descending flank of the body down to the base of the abdominal cavity. A known step control for this and continuous transport of the fish during the vertical approach of the gutting tool to the flank of the body result in the tool head, e.g. a tool element, having to follow a discontinuous, step-shaped line of movement. The resulting limited steepness of the feed path leads, at the same conveying speed, to the fact that with a short abdominal cavity the gutting tool hits the base of the abdominal cavity later than with a longer abdominal cavity, consequently also resulting, therefore, in an unsatisfactory gutting and cleaning result.

According to the prior art, it is further known for a fourth gutting tool to be arranged downstream of the three gutting tools for post-cleaning. Such a gutting tool is known from WO 2007/128386 A1. The post-cleaning tool is arranged on a carriage which is linearly movable and vertically movable in or counter to the conveying direction. To move the post-cleaning tool from a front point in the abdominal cavity up to the anus, the speed of the tool in the conveying direction is chosen to be greater than the conveying speed of the fish to be processed. Although according to WO 2007/128386 A1 the movement field of the gutting tool is improved, however, as a result of transversal, linear control movements, actuation and movements in the movement field remain limited. Due to the carriage drive, the linearly movable gutting tool is not suitable for an in-line arrangement of such tools in a plurality. Document DE 33 43 789 A1 also discloses a gutting tool mounted on a carriage which is moveable for running together with a fish to be gutted in the conveying direction of the fish and which is only slightly movable vertically.

The limitations explained for the known gutting devices with regard to controllable movements of the gutting tool limit the volume of the throughput, that is to say the number of fish to be processed per hour. In light of the foregoing, the objects of the invention are to make the movements of the gutting tools known per se (suctioners, scrapers, raspers, knives) of the gutting device flexible with regard to substantially reducing the dependence on the processing time, the phenotypic fish parameters and the fish conveying speed.

The objects are achieved in conjunction with the features of the gutting device referred to hereinbefore in that each gutting tool is suspended by means of a rocker system, having at least two crank rockers connected to each other in an articulated manner, namely a drive rocker at one end of the rocker system and the tool rocker hinging on the gutting tool at the other end of the rocker system, the rocker system further comprising a steering linkage, hingedly connected to the crank rockers and the gutting tool, formed by mutually articulated steering rods, by means of which angular positions between the crank rockers and between the gutting tool and the tool rocker can be continuously controlled, the drive rocker being pivotably hinged with a rocker pivot drive on a drive end distant from the tool rocker, said rocker pivot drive having a rocker drive axis arranged stationarily in the gutting device and being connected to the controller for controlling the pivot position of the drive rocker, the steering linkage being controllable by means of at least one steering pivot drive that controls the steering linkage, said

steering pivot drive being connected to the device controller for controlling the angular positions, and the device controller and the rocker system controlled thereby being configured in such a manner that the gutting tool for processing the fish to be processed can be moved in a co-running manner therewith in a conveying direction.

The measures according to the invention result in a number of advantages. With the rocker system according to the invention, configured for each gutting tool, in conjunction with the requirements for the gutting tools and their movement control, it is achieved that each gutting tool with its processing head or the tool tip of a working element can be moved to any desired processing/contact point within a large field of movement which largely covers the abdominal cavity in height and length. This is a dynamic are of movement such that the gutting tool moves together with the fish to be processed in a co-running manner in the conveying direction at a controlled speed.

The gutting tool is universally controllable in its height position such that, viewed from the conveyed fish, it can be moved both into and out of the abdominal cavity, in particular on a straight path vertical to and in particular perpendicular to the fish axis or central bone. Each gutting tool exactly follows the processing outline assigned to it in the abdominal cavity during the co-running movement. The operating direction and the speed of the tools are freely controllable within their operating range. One of the gutting tools which works in the region of the anus is triggered such that the step-shaped movement, usually dependent on the level of the fish conveying speed and resulting therefrom, is dispensed with and the tool head remains reliably in contact with a descending or ascending fish part in the abdominal cavity. Control of the operating speed of the gutting tool in the abdominal cavity, that is the difference between the fish speed and the tool speed in the fish conveying direction, leads to particularly satisfactory gutting and cleaning results. Thus, the cleaning performance can be significantly improved by increasing the residence time of the gutting tool in the region to be gutted or cleaned. The gutting tools are reliably moved out of the abdominal cavity without collision.

The gutting tools arranged in series on the processing line or on the conveying path advantageously have essentially coinciding rocker systems. Each rocker system is suspended and pivotably hinged at three fixed (stationary) pivot points at a stationary location in the gutting device. Advantageously, two of the three pivot points are arranged at one and the same location. Stationary arrangement is to be understood as

any arrangement with which the rocker system is hinged to pivot points or drive pivot axes that are stationarily positioned in the gutting device. The gutting device can be designed as a single module, as part of a slaughtering machine or as part of a whole slaughter line.

The mutually articulated rockers and the steering linkage of the rocker system holding the gutting tool in controlled angular positions ensure the implementation of rotational control movements which bring about the universal movement of the gutting tool within the field of movement in a plane which is defined by the fish conveying direction and the vertical movement component of the gutting tool, with at least three degrees of freedom. For controlling the movement, the rocker pivot drive and the steering pivot drive are coordinated with each other to cooperate in an optimum manner in order to move the tool head on a short path, by means of control by the device controller, to the point to be processed and along the required processing path.

Particularly advantageously, four gutting tools can be arranged along the processing line, which tools are equipped with identical rocker systems and can be flexibly moved for gutting/cleaning, particularly even at a high throughput speed. An especially preferred processing sequence, and assignment of four gutting tools to defined operating/working areas, consists, in the case of tail-first conveying, in that the first gutting tool is moved along the processing line up to the base of the abdominal cavity and then along the central bone up to the head or to the collar bone. The subsequent second gutting tool then enters the abdominal cavity in the region of the anus and leaves it approximately in the central longitudinal region. A subsequent third gutting tool is moved along the same locus as the first gutting tool. A final fourth gutting tool is inserted in the central longitudinal region of the abdominal cavity and moved out of the abdominal cavity in the region of the anus. A preferred measure of the method consists in that the processing paths of the second gutting tool and the fourth gutting tool coincide with the opposite directional path. Particularly advantageously, the tool speed in the conveying direction is temporarily selected to be approximately twice as high or higher than the fish conveying speed.

It has been found that the objects according to the invention are achieved particularly advantageously with rocker systems that are each formed by only two crank rockers hinged in series, namely by the drive rocker and the tool rocker. This achieves a space-saving arrangement with nevertheless unlimited flexibility of the movement control. This

design is also important for ensuring hygiene requirements. Thus the mechanism with movable mechanical parts, whose operation and maintenance must not lead to any contamination with the fish to be processed, remains particularly reduced.

A preferred design consists in that the rocker system and the associated steering linkage are hinged at coinciding fixed pivot points via concentric drive axes.

In particular, the steering linkage is designed and connected to the associated crank rockers in such a manner that the gutting tool is identically aligned in any position of the crank rockers and consequently in any position of the gutting tool, without compromising the flexibility of the location points/areas of the processing to be approached. This is achieved advantageously in that the steering linkage is formed by a parallelogram linkage, each rocker remaining aligned parallel to at least one said steering rod.

In the design with a rocker system that has the two mutually articulated crank rockers, the drive axes of the rocker pivot drive and of the steering pivot drive being concentric, the steering linkage is advantageously formed with a first steering rod and a second steering rod which lie parallel to the drive rocker and with a third steering rod which lies parallel to the tool rocker. In this design, a first four-bar linkage, namely a first linkage parallelogram, is formed by the drive rocker with fixed pivot point, the inner first steering rod lying parallel thereto and a pair of shorter steering arms. At one end the one short steering arm is non-rotatably connected to the steering pivot drive at the one stationary pivot point and at the other end it is pivotably hinged to the first steering rod. The tool rocker is a two-arm lever with one long lever arm and one short lever arm. On one free end the drive rocker is non-rotatably connected to the rocker drive at the other stationary pivot point. The other end of the drive rocker is hinged to the pivot point between the lever arms of the tool rocker, the short lever arm forming the other short steering arm of the pair of short steering arms of the first linkage parallelogram. An outer second steering rod lies parallel to the inner first steering rod. The outer second steering rod is hinged to a stationary pivot point at one free end and at its other end is connected, so as to pivot movably, to a long arm of a two-arm angle lever, said lever being hinged at a pivot point between its arms to the pivot point of the tool rocker. The four-bar linkage, with the two stationary pivot points and the pivot points of the long arm of the angle lever, forms a second open linkage parallelogram. The angle lever forms a coupling lever which is hinged with its short arm to the third steering rod parallel to the

tool rocker. The third steering rod, the long lever arm of the tool rocker and the short arm of the angle lever and, opposite, a holding lever hinged to the long lever arm of the tool rocker and the third steering rod, which holding lever holds the gutting tool, form a third closed linkage parallelogram.

By means of this rocker system in cooperation with the control device controlling it, at least one gutting tool can easily be moved with the fish to be processed in a co-running manner in the conveying direction at speeds which are greater than the conveying speed, for example twice the speed, or equal to the conveying speed of the fish to be processed. Likewise, this or another gutting tool can be moved in the conveying direction at speeds which are less than the conveying speed of the fish to be processed. It remains particularly important that during such operation any point in the abdominal cavity can be approached via short paths.

According to one embodiment, the device controller is connected to a contact control which continuously detects the processing contact of the gutting tool with a fish part to be processed and maintains said processing contact continuously controlled along a processing path based on the detection of said contact. In combination with the control of an arbitrary processing point, the gutting tool can be adapted to the contour to be processed with descending, ascending and/or curved parts or sections in the abdominal cavity. In conjunction with the control of the co-running movement according to the invention, the contact control is very advantageous as simple means for detecting the processing contour in the abdominal cavity from outside the fish are not available before or during the processing.

The contact control is preferably formed by a control section of the device controller. This can generally be a central control device of the gutting device or also an associated system or machine. The device controller can generally also be formed by independent, separate control modules. Conventional computer control means, which in particular are programmable, are used for controlling and regulating the said functions. Advantageously, the device controller is connected to at least one contact measuring element which, for controlling at least one of the two control drives, i.e. the control drive of the drive rocker and the control drive of the steering linkage, measures a drive torque of the associated pivot control drive. In conjunction with the contact control, the device controller is designed and configured such that the control takes

place continuously with an uninterrupted target/actual comparison, with delay-free tracking being ensured.

Advantageously, the device controller is configured in such a manner that the processing contact of at least one of the said gutting tools, which works in the fish conveying direction at high speed, for example at twice the fish conveying speed, counter to an ascending body section, is maintained without interruption. This measure only becomes possible according to the invention in that the gutting tool is always movable into any working/processing position inside said processing field by means of the controlled rocker system.

In particular during the co-running movement, adjacent gutting tools can be brought into an especially small transfer gap between the two gutting tools in such a manner that the abdominal cavity is reliably held open by means of the gutting tools during the transition or changeover from one gutting tool to the other.

In conjunction with the features of the method referred to hereinbefore, a method according to the invention consists in that each gutting tool for carrying out an associated processing operation in the abdominal cavity is moved by means of rotational movements, with at least three degrees of freedom, in a plane which is defined by the processing line and a vertical movement component of the gutting tool, wherein one working movement of the gutting tool, each, namely an insertion control movement leading into the abdominal cavity, a retraction control movement leading out of the abdominal cavity and a co-running tool movement, with which the gutting tool moves along with the fish to be processed during the intervention in the abdominal cavity, results due to a cooperation of the rotational movements, which are produced by means of a stationarily arranged and pivotably suspended rocker system having at least two mutually articulated crank rockers controlled and steered according to the said control variables.

The designs of the invention are always aimed at extending the residence time of the gutting tools in the abdominal cavity without restriction by the fish conveying speed. The co-running movements achieved according to the invention, with which the gutting tools move in the conveying direction together with the fish to be processed, can be controlled depending on the processing location, i.e. dependent on the location of the processing point and the processing requirement. For example, one control is such that

the gutting tool is moved in the conveying direction at the same speed as the fish conveying speed. This makes it possible to adjust and program the time at which an action for severing and/or suctioning a fish part is required. Correspondingly, at a tool speed in the conveying direction which is less than the fish conveying speed, the processing can be intensified locally and/or in terms of time in a longitudinal region of the abdominal cavity according to the difference in speed. A speed of co-running movement of the gutting tool which is significantly greater than the fish conveying speed is used over a longer section on the base of the abdominal cavity and in an ascending sloping region of the abdominal cavity to achieve cleaning by scraping and reliable tearing off of parts scraped off. On the other hand, a short temporary increase in the tool speed beyond the fish conveying speed in the direction of co-running movement is used to move the tool out of the abdominal cavity without collision, particularly on the head-side end of the abdominal cavity. Conversely, the tool speed of the gutting tool which moves by the co-running manner with the fish can also be temporarily reduced in a targeted manner in order to guide it out of the abdominal cavity.

The movement area for the gutting tools or their tool elements and tool tips achieved with the measures of the invention also advantageously enables movement control in such a manner that at least one gutting tool is moved in a position not co-running with the fish during at least one short phase in the abdominal cavity in relation to the processing time of said gutting tool. In particular, the gutting tool which is fixed with respect to the processing line or horizontally can be introduced into the abdominal cavity with a movement counter to the fish conveying direction such that the residence time subsequently available is increased or further optimised during the co-running movement. A short phase can also be set up in which the gutting tool remains unmoved during processing, that is stationary, in relation to the processing line.

It becomes clear that, on the whole, the flexibility of the movement control and therefore the gutting and cleaning quality are achieved without being restricted by the level of the throughput speed.

Dependent claims are directed at the said embodiments and also other expedient and advantageous embodiments of the invention. Only particularly expedient and advantageous embodiments or embodiment options will be described in greater detail, based on the following description of the embodiments illustrated in the schematic

drawing. Each individual or detail design described within an embodiment should be understood as a structurally independent detail example for other embodiments and designs which fall within the invention that are not described or not fully described. The drawings show:

Fig. 1 - 3 in longitudinal view a gutting device according to the invention with three gutting tools suspended on associated rocker systems,

Fig. 4 a drive device for driving a gutting tool and

Fig. 5 in longitudinal view a fish to be processed with tool paths.

A gutting device 1 according to the invention shown in Fig. 1 to 3 is only illustrated with parts and sections essential to the description of the invention. Three gutting tools 3, 31, 32, 33 with tool tips 300 are arranged in series one behind the other along a conveying path or a processing line 100. The gutting tools 3 are associated with three corresponding processing stations 2 which are denoted by 21, 22, 23 in the sequence of their arrangement along the processing line 100 and viewed in the fish conveying direction F. Accordingly, the gutting tools following each other in the conveying direction F are denoted by 31 (first gutting tool), 32 (second gutting tool) and 33 (third gutting tool). Advantageously, a gutting device according to the invention also comprises a further downstream processing station 2, 24 which is only shown in dash-dotted lines in Fig. 1 and is equipped with a post-cleaning tool 3, 34 (fourth gutting tool) not illustrated.

An abdominal opening device 13 is located upstream in front of the first processing station 21. A fish measuring device 12, only illustrated schematically in Fig. 1, is located upstream of said abdominal opening device.

The gutting device 1 is equipped with a conveyor 11, having fish receptacles that are not illustrated, which convey the fish 9 in the conveying direction F. For example, fish receptacles with tail clamps 17 are arranged on a conventional conveyor 11 known per se, said tail clamps gripping the fish 9 to be conveyed by the tail and transporting them tail-first in the horizontal supine position. A fish 9 conveyed in such a manner, which is not shown in Fig. 1 to 3, is illustrated in Fig. 5. In particular, unheaded fish are usually

gutted. The transport between two consecutive tail clamps 17 takes place with a cycle time Z. For example, with the measures according to the invention described below, a cycle time of 2.5 s/fish, corresponding to a throughput rate of 24 fish per minute, is achieved. In this case, the average length of the abdominal cavity of a fish 9 is approximately 500 mm with a corresponding processing region A.

The gutting device 1 further comprises a computer-operated device controller 15 which controls the individual parts and units of the gutting device 1 for carrying out the processing operations. The device controller 15 is only illustrated schematically in Fig. 1. Control connections to the conveyor 11, the fish measuring device 12 and the abdominal opening device 13 are also visible there. Apart from that, the device controller 15 is connected to drives of the processing stations 2 via control or signal paths, not shown. In Fig. 1 and Fig. 4, associated signal/control ports which can be any interfaces, are denoted by 71', 81' 161' and 162'.

The individual parts and units of the processing stations 2, of the abdominal opening device 13 and of the conveyor 11 as well as the fish measuring device 12 and the device controller 15 are arranged on a rack or frame 10, not shown, of the gutting device 1. For example, the frame comprises an assembly wall 105 on whose front side seen in Fig. 1 to 3 the conveying path extends, above which conveying path the gutting tools 3 are arranged. In particular, mechanical components of the gutting device 1 are arranged on the rear side of the assembly wall 105. This includes, in particular, each drive device 18.

The processing stations 2, with the exception of each of the mounted gutting tools 3, are essentially matching in design. Therefore, the parts of one processing station, e.g. of the processing station 23 are described by way of example, using reference numbers shown in Fig. 2. Each station 2 comprises a drive device 18 illustrated in Fig. 4 with the associated control/signal ports 71', 81', 161' and 162'. The device controller 15 in Fig. 1 shows only the control interfaces for one of the processing stations 2.

According to the invention, each gutting tool 3 is suspended via a rocker system 4 at three stationary pivot points D1, D2 and D3 fixed in the frame or housing (stationary) of the gutting device 1. The pivot points D1, D2 coincide locally. The rocker systems 4 with all the levers and the mechanism of the pivot articulations are identical in construction.

The rocker system 4 comprises two crank rockers 5, namely a drive rocker 51 and a tool rocker 52 as well as steering rods 61, 62, 63 of a steering linkage 6 hinged thereto. The crank rockers 5 and steering rods 61, 62, 63 are levers which can be pivoted at pivot points about pivot axes which are transverse or perpendicular to the conveying direction F and a notional vertical plane parallel to the vertical assembly wall 105.

In the embodiment, the end of the drive rocker 51 is connected non-rotatably at the fixed pivot point D1 to a rocker pivot drive 7, e.g. a driven hollow shaft denoted as drive axis 70. The drive axis 70 is parallel to the pivot axes of the rockers 5 and the steering rods 61, 62, 63. The tool rocker 52 is hinged pivotably about a pivot axis 640 to the other end of the drive rocker 51 which is a single-arm lever. The tool rocker 52 is a two-arm lever with a long lever arm 521 and short lever arm 522, the pivot articulation about the pivot axis 640 being provided at the pivot point between the two lever arms 521, 522.

The steering linkage 6 is configured with its steering rods 61, 62, 63 in such a manner that the steering rods 61, 62, 63, the drive rocker 51 and the tool rocker 52 are four-bar linkages forming linkage parallelograms. The drive rocker 51 is parallel to the two steering rods 61 and 62. The first steering rod 61 is situated as the inner steering rod between the drive rocker 51 and the second, outer steering rod 62.

A closed first linkage parallelogram (drive four-bar linkage) is formed by the drive rocker 51, the first steering rod 61 parallel thereto and a pair of shorter steering arms. The one short steering arm is a drive arm 65 which is non-rotatably hinged at one end to a drive axis 80, for example a drive shaft, and at the other end is pivotably hinged about a pivot axis 611 to the one end of the first steering rod 61. The drive axis 80 passes through the hollow shaft of the drive axis 70, the two drive axes 70, 80 being concentrically mounted at the coincident fixed pivot points D1, D2. The other short steering arm of the first linkage parallelogram is formed by the short lever arm 522 of the tool rocker 52 which is hinged to the steering rod 61 about a pivot axis 612.

The second steering rod 62 is hinged pivotably on one end at the fixed pivot point D3 about a stationarily arranged pivot axis 621 and on its other end is hinged pivotably about a pivot axis 622 to a two-arm coupling lever which is formed by an angle lever 64. This has one long arm 641 and one short arm 642. The angle lever 64 is pivotably

hinged in its angle pivot point between the two arms 641, 642 about the pivot axis 640 at the pivot point between the two lever arms 521, 522 of the tool rocker 52. A coupling four-bar linkage formed with the fixed pivot points D1/D2 and D3 and with the pivot points associated with the pivot axes 622, 640 is a second open linkage parallelogram.

The third steering rod 63 is pivotably hinged at one end to the free end of the short arm 642 about a pivot axis 631 and at its other end to the one end of a holding lever 66 about a pivot axis 662. At its other end, the holding lever 66 is connected pivotably to the tool rocker 52 about a pivot axis 661. The long lever arm 521 of the tool rocker 52, the steering rod 63 parallel thereto, the holding lever 66 and the short leg 642 of the angle lever 64 form a tool four-bar linkage hinging the gutting tool 3 in the form of a closed third linkage parallelogram.

The holding lever 66 carries the tool 3. The lever angle between the arms 641 and 642 and the angle position of the holding lever 66 determine the working orientation of the gutting tool 3. Each gutting tool 3 is held in principle in a steep orientation aimed counter to the conveying direction F. In the embodiment, these orientations of the gutting tools 31, 32, 33 coincide, the lever angles of the three angle levers 64 associated with the gutting tools 31, 32, 33 being different. The lever angle of the angle lever 64 of the first processing station 21 is acute, and the lever angles of the following processing stations 22, 23 are, in this order, increasingly larger and obtuse. Correspondingly, in the illustration according to Fig. 1, in which the gutting tools 31, 32, 33 are in starting or return positions, the starting distances between the steering rods 61, 62 increasing in pairs, the drive rockers 51 and the tool rockers 52 each being dimensioned equally long. It can also be seen that the rocker system 4 can be arranged, if required, in a space upstream of the gutting tool 3, for example in the processing station 21, or downstream of the gutting tool 3, for example as in the processing stations 22, 23. The arms 641, 642 of the angle levers 64 are oriented accordingly. The invention is not limited to the arrangement pattern of the rocker systems 4 illustrated in the embodiment in terms of generating the co-running movements of the gutting tools 31, 32, 33.

It can be seen that, due to the steering linkage 6, angle positions between the drive rocker 51 and the tool rocker 52 on the one hand and between the gutting tool 3 and the tool rocker 52 on the other hand can be steplessly controlled according to the controlled drive pivot positions of the drive axes 70 and 80. As a result of the

cooperation between the linkage parallelograms described, the orientation of the gutting tool 3 can be maintained in any position of the said gutting tool 3. This is illustrated by the same orientation of the tools 31, 32, 33 according to Fig. 1 to Fig. 3. As can be seen, in the embodiment the gutting tools 31, 32, 33 are also held in parallel alignment with each other. Moreover, the tool tip 300 is moved by means of the rocker system 4 into any desired controlled position or is movable into this position. As can also be seen from Fig. 1 to Fig. 3, the tool tips 300 are in particular designed as suction openings of suction pipes, the suction openings having scraping, knife or rasping edges. For suctioning out internal organs or parts thereof, suction pipes of the gutting tools 3, as not shown here, are each connected to a suction device which is controlled in a tool-related manner by the device controller 15.

The drive device 18 illustrated in Fig. 4 is equipped with drive motors 71, 81, which are preferably formed by controllable servomotors, both for the rocker pivot drive 7 and also for the steering pivot drive 8. The rocker drive 7 comprises a crank arm 73 non-rotatably connected to the drive shaft 70 of the drive rocker 51. The drive shaft 700 of the motor 71 is non-rotatably connected to a motor crank 72, and free ends of the cranks 72, 73 are pivotably connected to the ends of a coupling rod 74. Arranged on or in the coupling rod 74 is a measuring element 161 which is connected to the device controller 15 via an interface 161'. The measuring element 161 is designed in such a manner that, as a result, it similarly continuously detects the load transferred with the coupling rod 74. This achieves a contact control, described in greater detail below, using the device controller 15 in that the measuring element 161 detects any change in the drive torque as a result of applying or relieving the load on the tool head during operation and accordingly continuously and steplessly controls the position of the tool head. Any other contact control with a corresponding function can be provided.

In the embodiment, the steering pivot drive 8 is arranged and configured like the rocker pivot drive 7. The steering pivot drive 8 is operated via the coupling rod 84 and the cranks 82, 83 pivotably hinged thereto. The crank 82 is non-rotatably connected to a drive shaft 800 of the drive motor 81. The crank 83 is non-rotatably connected to the drive axis 80. A measuring element 162 continuously measures the load state of the drive on the coupling rod 84. The drive motors 71, 81 are controlled as a function of the load states determined by means of the device controller 15.

The fish processing for gutting according to the measures according to the invention is explained in greater detail based on Fig. 1 to 3 and Fig. 5.

In Fig. 1, all the tools 3 are in the retracted or waiting position at a height above the level of a fish body not illustrated in Fig. 1. The tool tips 300 are at the height of a position line 101. Likewise, a circular knife 131 of the abdominal opening device 13 is at the height of the position line 101. Each gutting tool 3, after leaving the operative position in the fish 9, takes up the retracted position after the expiry of a tool return time W within the cycle time Z. This means that the gutting tool 3 is available for processing for the next fish or cycle.

In Fig. 2, the circular knife 131 of the abdominal opening device 13 is in the operating state in which it opens the abdominal cavity 93 of the fish 9 to be processed by slitting it open. During this process, the first gutting tool 31, namely a suctioner, is moved into the abdominal cavity 93. While the circular knife 131 is still located in the abdominal cavity 93, the second gutting tool 32, namely a rasper, is moved into the abdominal cavity 93 and is brought with its tool head to the height of the tool head of the gutting tool 31, the distance between the two tool heads being reduced or these heads being moved towards each other. The circular knife 131 is then brought into its retracted position and the gutting tools 31, 32 continue processing in the abdominal cavity 93 of the fish 9. In Fig. 3, the gutting tool 31 has already been moved out of the abdominal cavity 93, the tool tip 300 being back at the height of the position line 101, the retracted position lying further upstream, however, not yet having been reached. The circular knife 131 of the abdominal opening device 13 is already in engagement with the following fish. In the meantime, the gutting tool 33 has been moved out of its retracted position into an operative position in which the tool head of the gutting tool 33 is located in the vicinity of the tool head of the gutting tool 32, that is to say the tool heads have been moved towards each other. In this or the subsequent phase, the gutting tool 32 is moved out of the abdominal cavity 93 and moved into its retracted position. The gutting tool 33 continues its processing. The gutting tool 34, not illustrated, is then moved into the abdominal cavity 93, just like the gutting tools 31, 32 previously, and is brought with its tool head to the height of the tool head of the gutting tool 33. In this phase, the gutting tool 33 is moved out of the abdominal cavity 93.

According to the invention, tool paths of the gutting tools 31, 32, 33 and 34 achieved by means of co-running movements emerge from the example in Fig. 5. The associated

paths are indicated therein by lines 31', 32', 33' and 34'. The first gutting tool 31, when viewed from the tail-side end of the abdominal cavity 93, is moved into the abdominal cavity 93 in the processing region A after approximately twenty percent of the conveyor distance. Advantageously, the gutting tool 31 is moved out of its retracted position in a short phase of the feed path with the tool tip 300 counter to the fish conveying direction F and lowered. To achieve a long residence time, the gutting tool 31 is moved in a co-running manner with the fish 9 in fish conveying direction F by means of the controlled rocker system 4, that is at a tool speed in the fish conveying direction F that is, for example, approximately a third of the fish conveying speed or greater. The gutting tool 31 is moved out of the abdominal cavity 93 on the head side, and advantageously in that the tool speed in the fish conveying direction F is increased in this region or in the associated movement phase.

On entering the abdominal cavity 93 in the region of the anus 95, the gutting tool 32 moves in a co-running manner with the fish 9 in the fish conveying direction F and works along a work section of approx. 40% on the base of the abdominal cavity 93 so as to be moved out of the abdominal cavity 93 in the region in front the longitudinal centre thereof. The tool 32 also moves with the fish 9 in the fish conveying direction F such that a distinct residence time is achieved.

The third gutting tool 33 is then moved on the same path as the first gutting tool 31. This gutting tool is also moved during its working operation in the fish conveying direction F at a tool speed which is less than the fish conveying speed and is adjusted or controlled for a desired residence time.

The fourth gutting tool 34 is preferably moved into the abdominal cavity at the processing point at which the first gutting tool 31 was moved out thereof and is then moved in the fish conveying direction F at a tool speed which, for example, is twice the fish conveying speed, towards the anus 95 and at this point is moved out of the abdominal cavity 93 at an adapted lifting speed. In particular, during this cleaning process, the contact control cooperates with the movement control in an optimum manner by means of the rocker system 4. The tool tip 300 of the gutting tool 34 is continuously and reliably held on the body line to be processed in the abdominal cavity 93. This is achieved due to fine control by means of the measuring elements 161, 162 which is carried out by regulating the contact using the device controller 15. Likewise, all processing paths of the gutting tools 31 to 33 are advantageously controlled and

regulated by contact with the contour to be processed in the abdominal cavity 93. In this case, for an optimum result it is important that both the rocker pivot drive 7 and also the steering pivot drive 8 are controlled and regulated cooperatively by the contact control.

A thick continuous line illustrated in Fig. 5 from the time of starting the processing time B up to the end of the return time W schematically represents the sum course of the four gutting tools 31 to 34. It can be seen that, based on the movement sequences and controls according to the invention, the abdominal cavity 93 is optimally scraped out and suctioned out into the corners on its base and on the inclined and wall sections, the tool paths being optimally moulded to the processing contour, being moved optimally on the tail-side end of the abdominal cavity 93 into or out thereof and being moved optimally on the head-side end of the abdominal cavity 93 out of the abdominal cavity without collision and with optimum return being moved into the retracted positions. This is achieved according to the invention, in this respect without dependence on the fish conveying speed, in that the gutting tools move in a co-running manner in the fish conveying direction F. Overall, this results in a number of cooperative advantages. The gutting and cleaning quality is significantly improved, the throughput rate (fish conveying speed) is increased and the operating sequence is protected in particular against malfunction. The last-mentioned effect is achieved in particular in that the tool heads of adjacent gutting tools 31/32, 32/33 and 33/34 are likewise brought close together by utilising the co-running movement, that is they are brought towards each other with a short gap, in order for the gutting tool that is still working or is leaving the abdominal cavity 93 to hold open the abdominal cavity for the following gutting tool to enter, so as thus to prevent the abdominal slit opened by the circular knife 131 from closing. Flanks of the abdominal cavity 93 are held apart.

The operating principle and control known per se in conjunction with the fish measuring device 12, which detects the fish at a significant point, in particular at the point of its anal fin 94 and, apart from that, registers every fish 9 with fish-specific data, is part of the overall control of the gutting device 1. These data are normally used to determine and control the times of inserting the gutting tools 3 and to predetermine the movement paths of said gutting tools.

Claims

1. Gutting device (1) for gutting fish (9), comprising a conveyor (11) for conveying the fish (9) along a processing line (100) in a supine position and a longitudinal orientation, a fish measuring device (12) for detecting specific fish data, an abdominal opening apparatus (13) and processing means arranged above the processing line (100) for removing the internal organs, consisting of gutting tools (3) arranged one behind the other which can be controlled into and out of the opened abdominal cavity (93), wherein each gutting tool (3) is suspended by means of an associated tool rocker (52) controllable in its pivot position via two rocker pivot axes which both lie transverse to a vertical plane and to the conveying direction (F), and a computer-operated device controller (15) by means of which the controlled insertion, controlled retraction and processing paths of the gutting tools (3) are controllable, dependent on the fish conveying speed, the detected specific fish data and tool contact with fish parts to be processed in the abdominal cavity (93), characterised in that each gutting tool (3) is suspended by means of a rocker system (4), having at least two crank rockers (5) connected to each other in an articulated manner, namely a drive rocker (51) at one end of the rocker system (4) and at the other end of the rocker system (5) the tool rocker (52) hinging on the gutting tool (3), wherein the rocker system (4) further comprises a steering linkage (6), hingedly connected to the crank rockers (5) and the gutting tool (3), formed by mutually articulated steering rods (61 - 63), by means of which angular positions between the crank rockers (5) and between the gutting tool (3) and the tool rocker (52) can be continuously controlled, wherein the drive rocker (51) is pivotably hinged with a rocker pivot drive (7) on a drive end distant from the tool rocker (52), said rocker pivot drive having a rocker drive axis (70) arranged stationarily in the gutting device (1) and being connected to the controller (15) for controlling the pivot position of the drive rocker (51), wherein the steering linkage (6) is controllable by means of at least one steering pivot drive (8) that controls the steering linkage, said steering pivot drive being connected to the device controller (15) for controlling the angular positions, and wherein the device controller (15) and the rocker system (4) controlled thereby are configured in such a manner that the gutting tool (3) for processing the fish to be processed (9) can be moved in a co-running manner therewith in a conveying direction (F).

2. Gutting device according to claim 1, characterised in that the rocker system (4) is formed by two crank rockers (5), namely by the drive rocker (51) and the tool rocker (52).

3. Gutting device according to claim 2, characterised in that the rocker pivot drive (7) and a said steering pivot drive (8) are arranged at coinciding pivot points (D1, D2) with concentric drive axes (70, 80).

4. Gutting device according to any one of claims 1 to 3, characterised in that the steering linkage (6) is designed and hinged in such a manner that the gutting tool (3) is aligned in the same way in any position of the crank rockers (5).

5. Gutting device according to any one of claims 1 to 4, characterised in that the rocker system (4) forms at least three four-bar linkages with the crank rockers (5) and the steering linkage (6).

6. Gutting device according to claim 5, characterised in that the rocker system (4) comprises a drive four-bar linkage on the input side, a tool four-bar linkage hinging to the gutting tool (3) on the output side and a coupling four-bar linkage which couples the drive four-bar linkage to the tool four-bar linkage.

7. Gutting device according to claim 6, characterised in that the arms (641, 642) of a two-arm coupling lever are a lever of the coupling four-bar linkage and a lever of the tool four-bar linkage.

8. Gutting device according to claim 6 or 7, characterised in that the drive four-bar linkage is suspended at coinciding fixed pivot points (D1, D2) which form the stationarily arranged rocker pivot drive (7) and the steering pivot drive (8).

9. Gutting device according to claim 8, characterised in that the coupling four-bar linkage is suspended at the fixed pivot point (D2) associated with the steering pivot drive (8) and a further fixed pivot point (D3).

10. Gutting device according to any one of claims 1 to 9, characterised in that the steering linkage (6) is formed by a parallelogram linkage, wherein each crank rocker (5) is always aligned in parallel with at least one of said steering rods (61 - 63).

11. Gutting device according to any one of claims 1 to 10, characterised in that the rocker system (4) and the control are configured by means of the controller (15) in such a manner that at least one of said gutting tools (3) is movable for running together with the fish to be processed (9) in a conveying direction (F) at a speed which is greater than the conveying speed or equal to the conveying speed of the fish to be processed (9).

12. Gutting device according to any one of claims 1 to 11, characterised in that the rocker system (4) and the control are configured by means of the controller (15) in such a manner that at least one of said gutting tools (3) is movable for running together with the fish to be processed (9) in a conveying direction (F) at a speed which is less than the conveying speed of the fish to be processed (9).

13. Gutting device according to any one of claims 1 to 12, characterised in that the device controller (15) is configured with a contact control which continuously detects the processing contact of the gutting tool (3) with a fish part to be processed and continuously maintains said processing contact along a processing path based on the detection of said contact.

14. Gutting device according to claim 13, characterised in that the device controller (15) is connected to at least one contact measuring element (161, 162) which for controlling at least one of the two control drives, that is the control drive (7) of the drive rocker (51) and the control drive (8) of the steering linkage (6), measures a driving torque of the associated control drive (7, 8).

15. Gutting device according to claim 14, characterised in that the device controller (15) is configured in such a manner that the processing contact of at least one of said gutting tools (3), which works with a corresponding speed difference between the gutting tool (34) and the fish to be processed (9) in the

fish conveying direction (F) towards an ascending processing section, is maintained.

16. Method for gutting fish (9) which are conveyed along a processing line (100) in a supine position and a longitudinal orientation, wherein specific fish data are detected by means of a fish measuring device (12), first the abdomen being opened and then the abdominal cavity (93) being cleared and cleaned with a plurality of gutting tools (3) arranged one behind the other along the processing line (100), wherein movements of the gutting tools (3) are controlled dependent on control variables, namely on the measured fish data, on processing contact with fish parts in the abdominal cavity (93) and on the fish conveying speed, wherein all the gutting tools (3) during their positions in the abdominal cavity (93) are moved in a co-running manner with the fish to be processed (9) in the fish conveying direction (F) dependent on the processing position and the processing operation, wherein the co-running movements are carried out at tool speeds which are less than, equal to or greater than the fish conveying speed, characterised in that each gutting tool (3) for carrying out an associated processing operation in the abdominal cavity (93) is moved by means of rotational movements, with at least three degrees of freedom, in a plane which is defined by the processing line (100) and a vertical movement component of the gutting tool (3), wherein a working movement of the gutting tool (3), each, namely an insertion control movement leading into the abdominal cavity (93), a retraction control movement leading out of the abdominal cavity and a co-running tool movement, with which the gutting tool (3) moves along with the fish to be processed (9) during the intervention in the abdominal cavity, results due to a cooperation of the rotational movements which are produced by means of a stationarily arranged and pivotably suspended rocker system (4) having at least two mutually articulated rockers (5) controlled and steered according to said control variables.

17. Method according to claim 16, characterised in that the method is carried out by means of a gutting device (1) according to any one of claims 1 to 15.

18. Method according to any one of claims 16 to 17, characterised in that at least one gutting tool (3) is moved during a short phase, compared to the

processing time of the gutting tool (3) in the abdominal cavity (93), in a position not co-running with the fish (9).

19. Method according to any one of claims 16 to 18, characterised in that an average tool speed in the fish conveying direction (F) is greater than a third of an average fish conveying speed.

20. Method according to any one of claims 16 to 19, characterised in that the fish (9) are conveyed tail-first and at least one of said gutting tools (3) is moved at a greater speed than the fish conveying speed with a simultaneous lifting stroke for guiding out of the abdominal cavity (93) at the head end of said abdominal cavity (93).

21. Method according to any one of claims 16 to 20, characterised in that at least one of said gutting tools (3), namely a post-cleaning scraping tool (34) for post-cleaning, is guided at greater speed than the fish conveying speed (F) towards an ascending base region of the abdominal cavity (93) up to the anus (95) and is there moved out of the abdominal cavity (93).

22. Method according to claim 21, characterised in that the post-cleaning scraping tool (34) is operated by means of a contact control which continuously maintains the contact of the post-cleaning scraping tool (34) with the ascending base region.

23. Method according to any one of claims 16 to 22, characterised in that at least one of said gutting tools (3) co-running together with the fish (9) in the conveying direction (F) is inserted vertically into the abdominal cavity (93).

24. Method according to any one of claims 16 to 23, characterised in that two adjacent gutting tools (31/32; 32/33; 33/34), each, are moved in positions within a small distance of their tool heads in the region of the abdominal cavity (93) in such a manner that the abdominal cavity (93) is held open by means of the upstream gutting tool (31; 32; 33) at least for insertion and at the commencement of operation of the downstream gutting tool (32; 33; 34) of the two adjacent gutting tools.

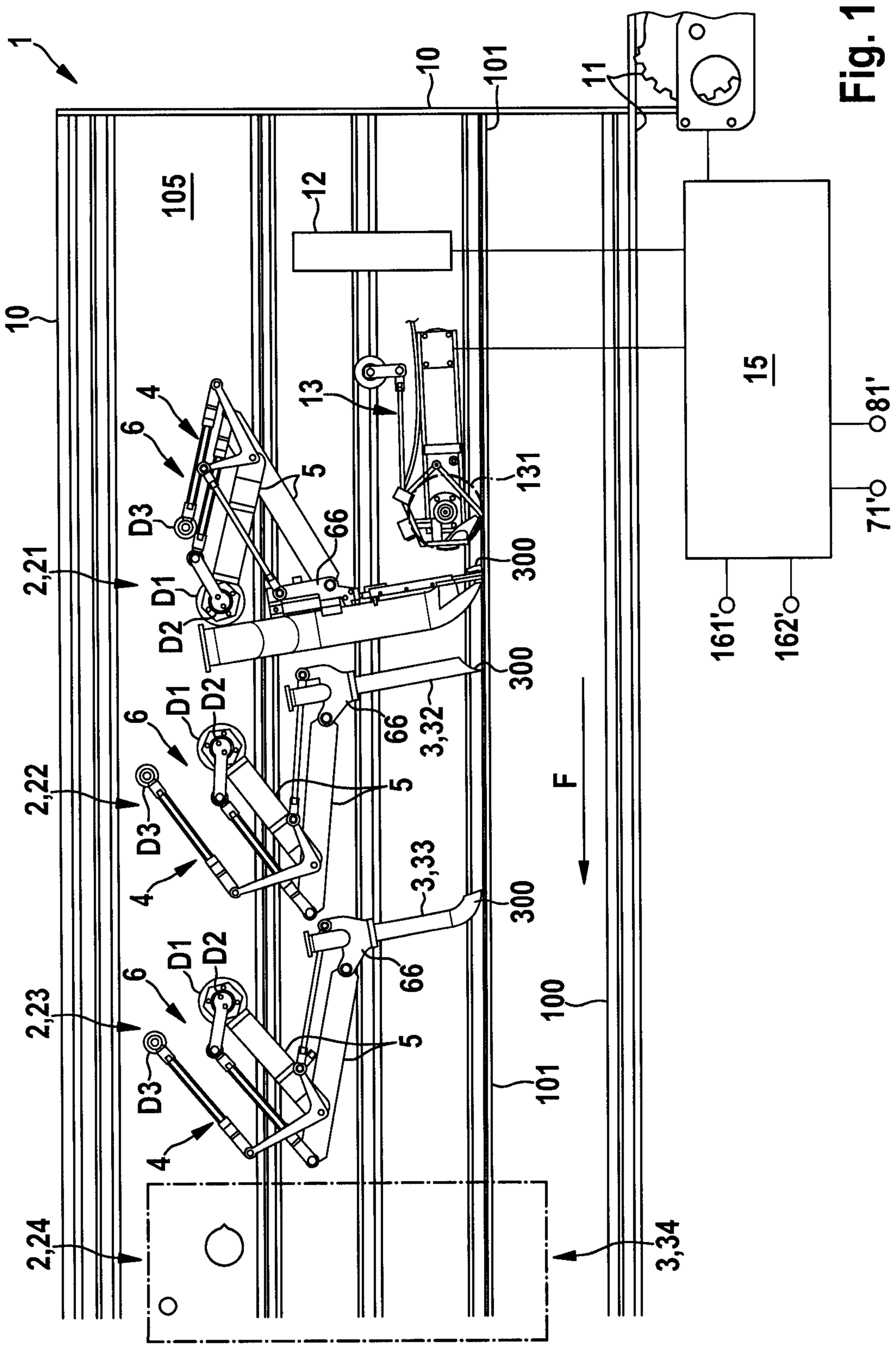
25. Method according to any one of claims 16 to 24, characterised in that the fish (9) are conveyed tail-first and the processing paths (31', 33') of the first and third gutting tool (31, 33) of three said gutting tools (31, 32, 33), arranged one behind the other along the processing line (100), start in the first tail-side third of the abdominal cavity (93) and are guided up to the head-side end of the abdominal cavity (93).

26. Method according to claim 25, characterised in that the processing paths (31', 33') of the first and third gutting tool (31, 33) are coincident.

27. Method according to claim 25 or 26, characterised in that the processing path (34') of a fourth gutting tool (34) downstream of the third gutting tool (33) starts in the middle of the abdominal cavity (93) and ends at the anus (95).

28. Method according to one of claims 25 to 27, characterised in that the processing path (32') of the second gutting tool (32) starts at the anus (95) and ends in the middle of the abdominal cavity (93).

29. Method according to claim 27 or 28, characterised in that the processing paths (32', 34') of the second gutting tool (32) and of the fourth gutting tool (34) coincide with the opposite directional path.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D2
D3
F
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Fig. 1

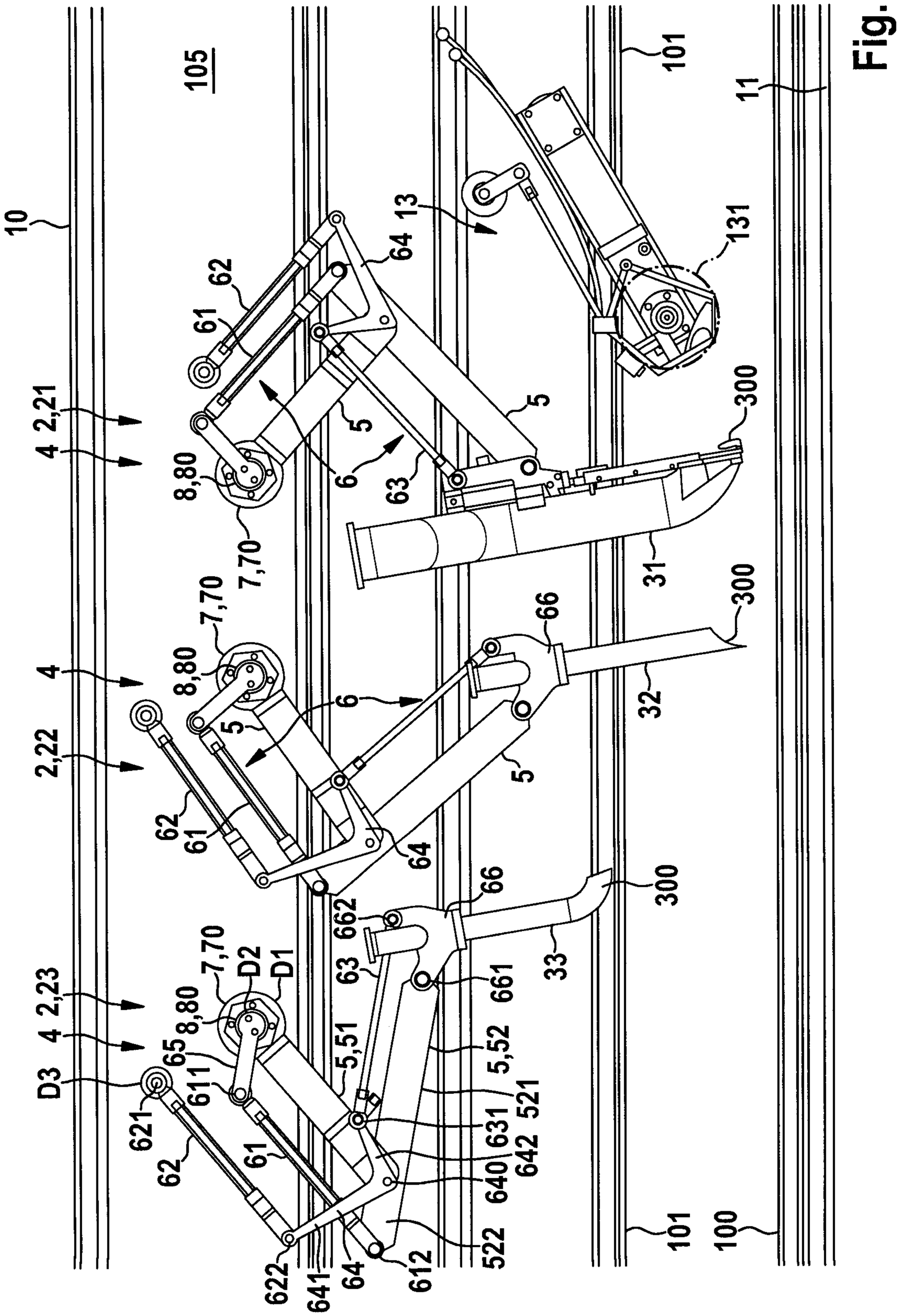
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Fig. 2

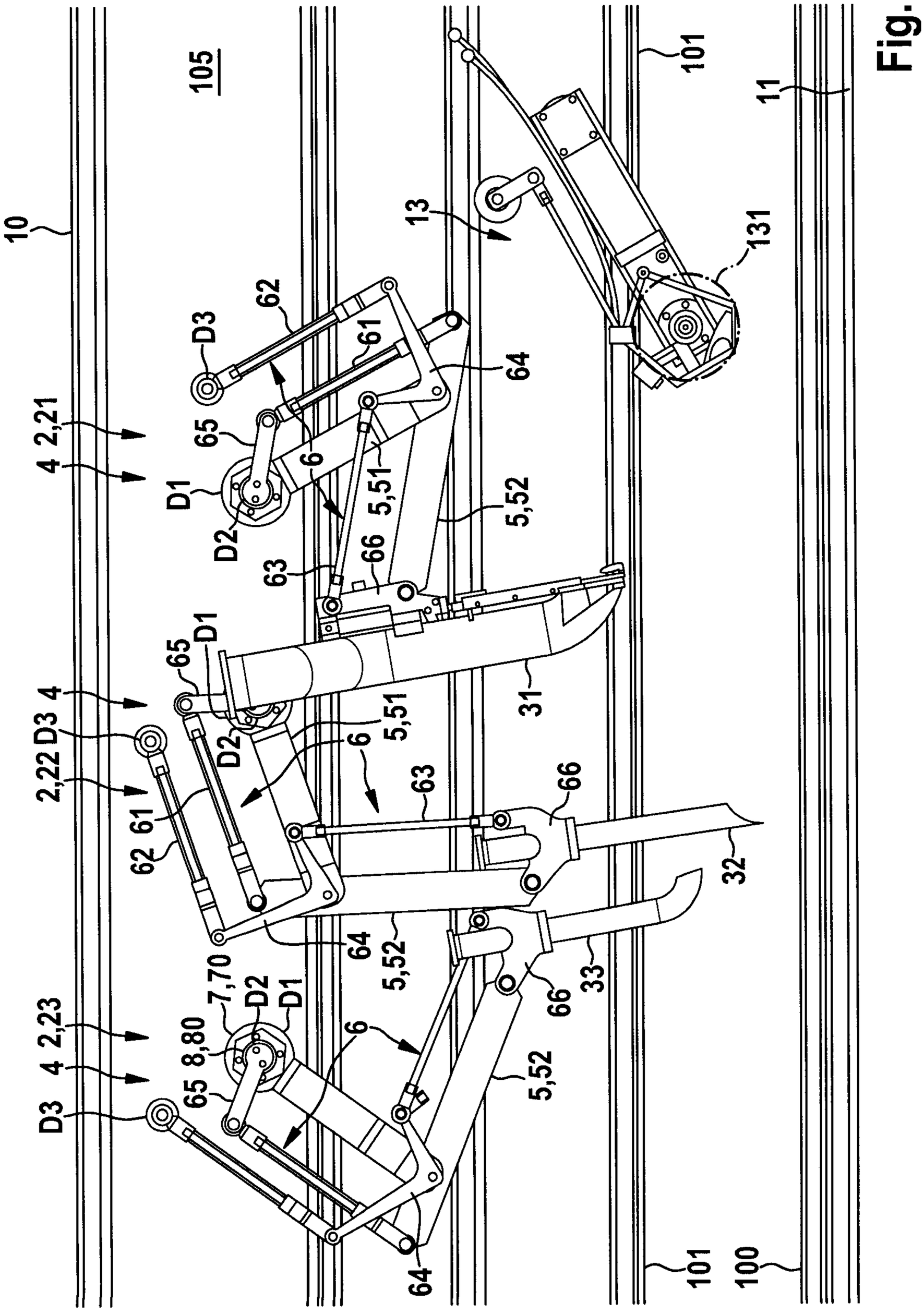
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Fig. 3

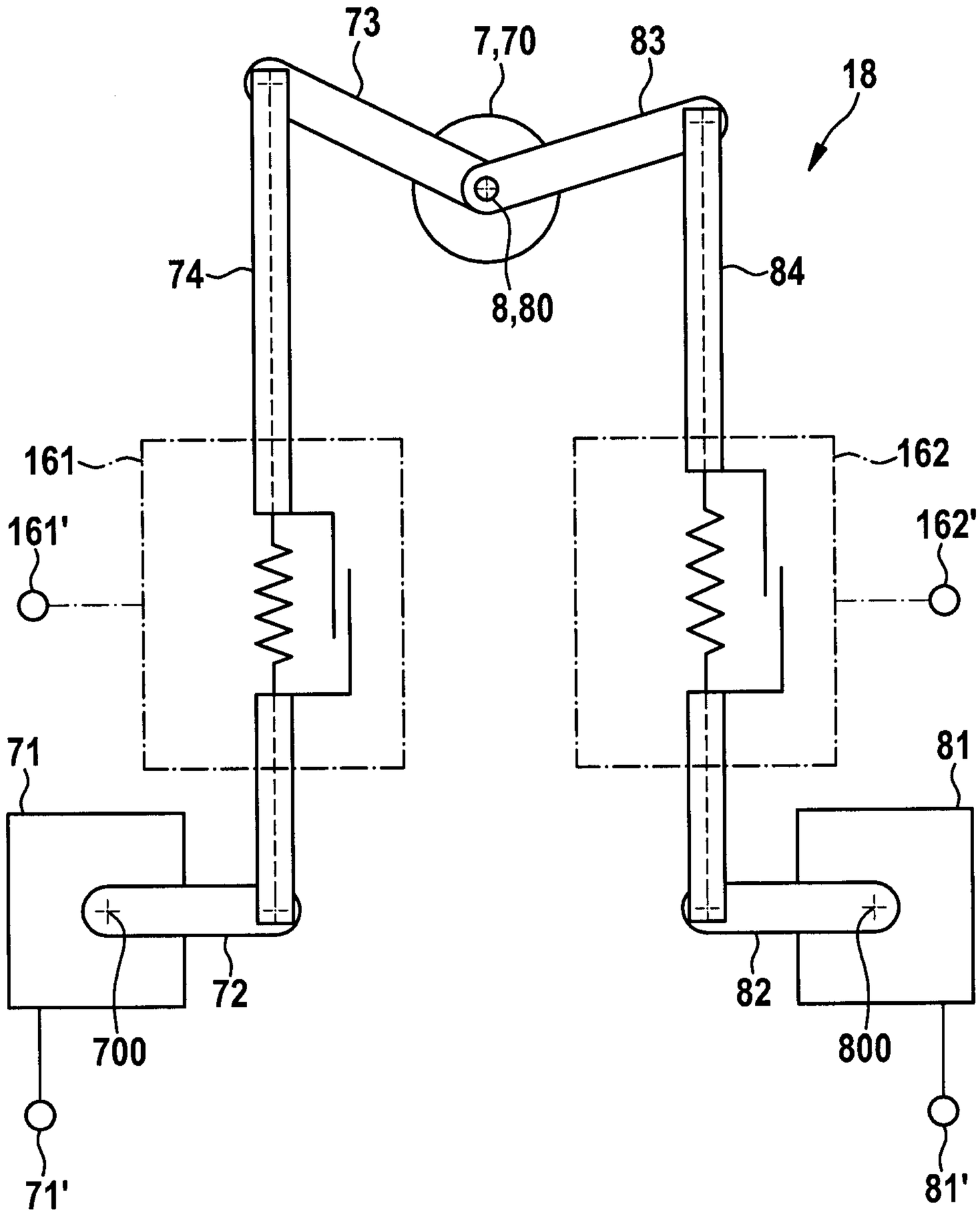
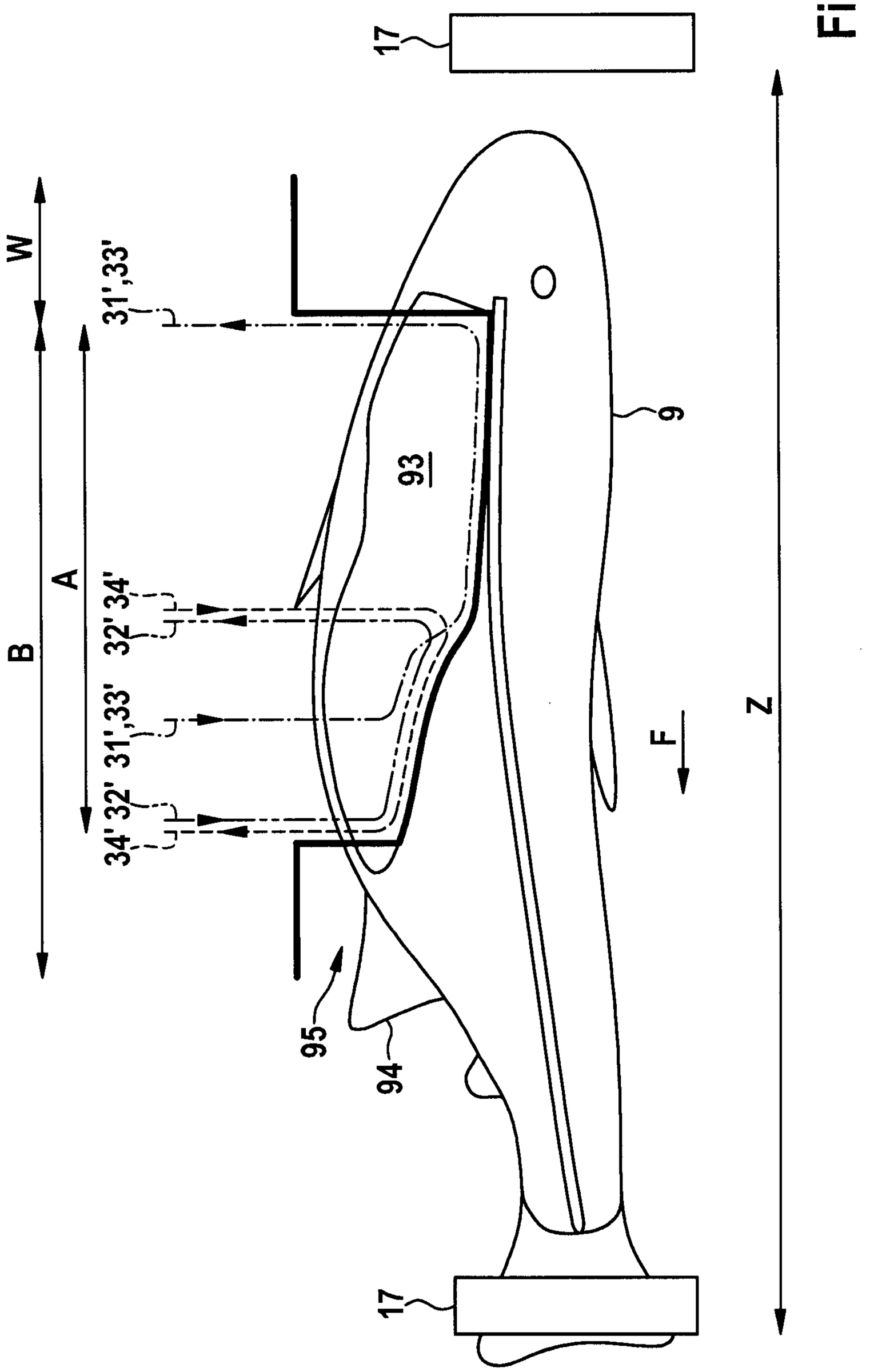
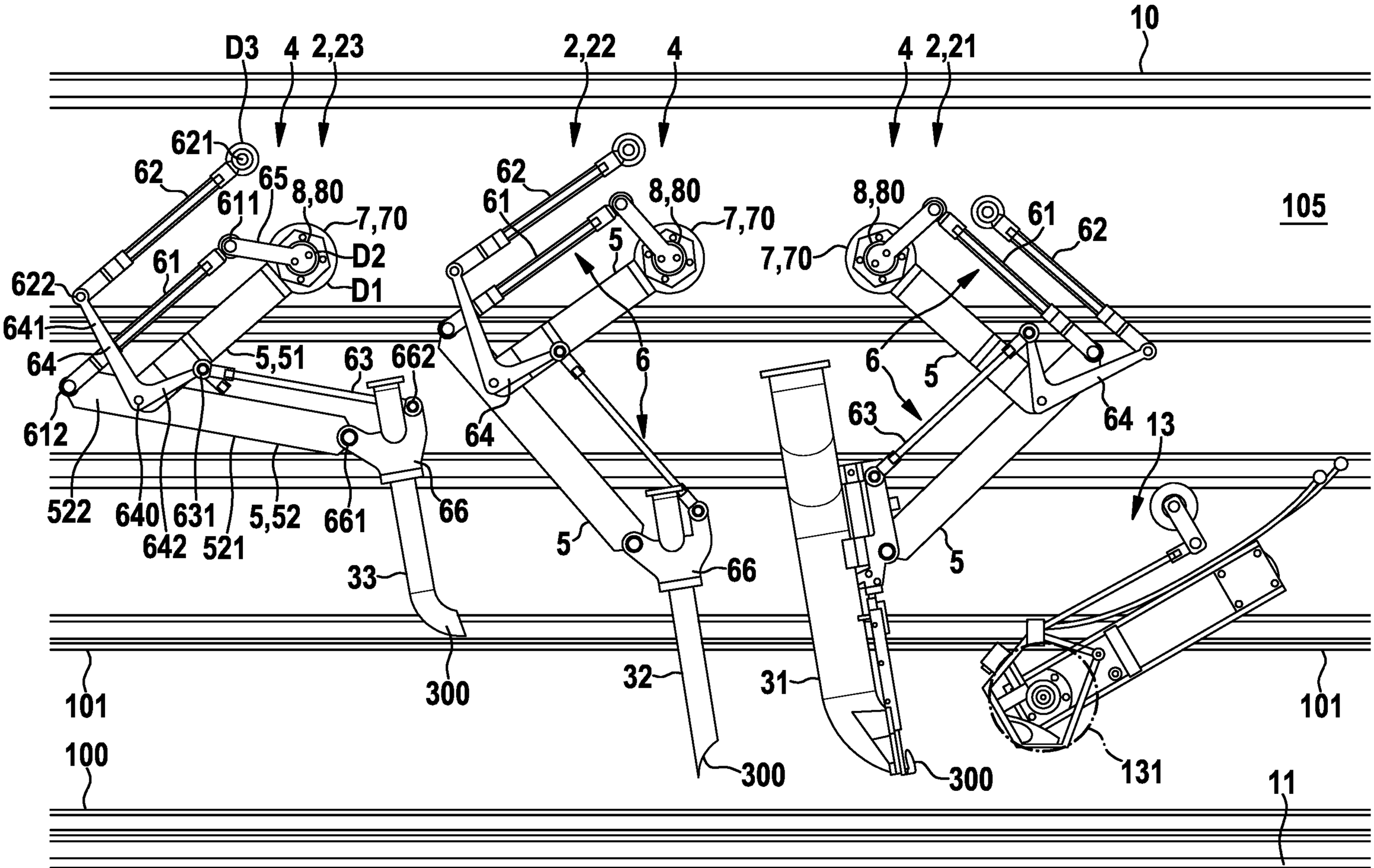


Fig. 4

Fig. 5

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D2
D1
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622
641
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612
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6
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64
13
5
31
300
131
101
11

Fig. 2