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DESCRIPTION

Purpose of the invention

[0001] More specifically, the invention relates to a device for the ventral and dorsal cutting of a pork carcass or the carcass of an animal with a similar corporeal structure, in a completely simultaneous manner. The device is preferably formed by two robots that are placed facing each other, with the cut along the dorsal side including the corner of the spine and vertebrae, while the ventral cut the spine.

[0002] The first robot is equipped with a mixed head, which can work by supporting the cutting means of the second robot. It may also work as a dissector for the spine, at the same time that separating the meat from the vertebrae by turning the support of the support means and the cutting means of the first robot by 180°, since the support means and the cutting means are mounted on a support which is on the last arm of the first robot.

State of the art

[0003] There are different types of systems on the market for cutting pork carcasses and carcasses of similar animals, which can therefore be considered as state of the art, and these systems are classified according to the type of functions performed by their elements. In the first group, we could include those formed by robots or alternative cutting means that perform corner cuts of the animal's body, for example that included in the French Invention Patent no. 2,923,357 describes and claims a system comprising two robots, a first robot holding the support means of a cutting head, and on the other hand the support means of the pork ventral support device, constituting the means for moving the cutting head and the ventral support device; and a second robot holding the support means of the dorsal support device, on the other hand constituting the means for moving the dorsal support device, the two robots being placed facing each other, with respect to the plane of displacement of the carcasses and separated by a free space allowing for passage between two carcasses.

[0004] This makes reference to this same background. In a second embodiment of the invention, the system comprises a single robot, at the same time holding the support means of the cutting head, the support means of the dorsal support and the support means of the ventral support device. On the other hand, this robot constitutes the means for moving the cutting head, the dorsal support device and the ventral support device. This robot is laterally delayed in relation to the plane of displacement of the carcasses to allow their passage.

[0005] European Patent no. No. 494,935 also belongs to the state of the art, in which a method and apparatus for separating a relatively weakly structured material from a relatively robust structure using a cutting device commanded by a robot is described. This procedure

and apparatus do not allow the cutting of animal carcasses, such as pork and similar.

[0006] There are therefore no known systems for cutting the animal through the spine in two, and cleaning the space between vertebrae from meat, being able to use the device in such a way that the first robot acts only as a support for the second robot; in this case the first robot acting with sensing means that hold the animal in a vertical position when the second robot acts, cutting the animal into two practically equal halves.

Object of the invention

[0007] One of the purposes of the invention is to provide a device that allows for the cutting, in practically equal halves, of the body of a pig or an animal of similar morphology that has already been sacrificed, following the spine thereof, while the intervertebral space is cleaned of meat, in such a way that said device can perform a ventral cut of the spine and a second dorsal cut consisting on separating the meat from the space between the vertebrae.

[0008] Another purpose of the invention for the first robot is to operate with only one head, but only in terms of keeping the animal placed vertically between the two robots, in a position allowing the second robot to cut the spin of the animal so dividing in two parts.

[0009] Another purpose of the invention is to replace the manual cleaning operations of the intervertebral spaces of the pork spine with a cutting operation by means of two blades, which omits the previous operation, saving time in the treatment of the slaughtered animal and, the corresponding money resulting from the substitution of a manual operation for an alternative automatic operation.

[0010] Another purpose of the invention is to reduce the maintenance costs for systems that are used in a non-simultaneous manner to cut the body of a pig or of a similar animal in two halves via its spine and the cutting of the skin and bordering tissues, regardless of whether said systems clean the intervertebral spaces; only two robots are recommended for the functioning of the device, one of them with a double function and the second always with the same function.

[0011] Another purpose of the invention is to supply the market with alternatively cut pork or parts of pork, which are adapted to the tastes of Asian consumers with other ways of consuming said products.

Description of the invention

[0012] The device of the invention is defined in the first claim.

[0013] The proposed device comprises two robots arranged facing each other in front and behind of the transport carousel of the slaughtered animals, suspended by the appropriate means forming a sort of vertical plane in which:

- A first robot disposed on a support incorporated into the upper arm thereof, the first robot comprising:
 - means for supporting the means for cutting the spine of the animal's carcass into two, located on the second robot of the animal's carcass;
 - means for immobilising the animal;
 - means for cutting the skin and tissues bordering said skin; and
 - means for cutting and cleaning meat from the animal in the intervertebral spaces.
- A second robot, located in front of the ventral plane of the animal, comprising:
 - means of palpation on the ventral part of the animal, and
 - means for cutting the spine along its central part.

[0014] The proposed device comprises two robots arranged facing each other in front and behind of the transport carousel of the slaughtered animals, suspended by the appropriate means forming a sort of vertical plane in which:

- A first robot, located in front of the dorsal plane of the animal, comprising:
 - means for supporting the means for cutting the spine of the animal's carcass into two, located on the second robot;
 - means for dorsal cutting the skin and tissues bordering said skin;
 - means for dorsal cutting and cleaning meat from the animal in the intervertebral spaces; and
 - an articulated arm disposed on a support, the arm for positioning and displacing the means for dorsal cutting the skin and tissues bordering the skin and the means for dorsal cutting and cleaning meat from the animal in the intervertebral spaces.
- A second robot, located in front of the ventral plane of the animal, comprising:
 - means of palpation on the ventral part of the animal,
 - means for cutting the spine along its central part, and
 - an articulated arm for positioning and displacing the means of palpation and the means for cutting the spine.

[0015] These robots act facing each other and in a simultaneous manner, mounted on the floor or on a strong base or pedestal built on the floor of the system, and are aligned in front of and behind the carousel to transport the previously slaughtered animals. The animals are suspended from the carousel and follow a longitudinal trajectory. Their movement is interrupted when the animal is positioned in front of the two robots, and the animal's body becomes immobilised by means of lateral angled arms installed on the first robot. At this point,

the two robots come into action, as detailed below.

[0016] Firstly, once the animal is immobilised by the angled arms, two tilting rollers which are incorporated into the first robots come into action. These rollers follow the morphology of the animal and prevent it from moving forward or backwards when the animal is severed. At the same time, the spine is cut and the intervertebral space is cleaned by the blades - preferably two and circular-shaped. The blades cut the skeleton, whose planes are convergent.

[0017] The convergence of the blades installed on the head incorporated into the first robot can be regulated to adapt to the morphology of the animals to be handled in a fully automatic manner.

[0018] At the same time, a blade from the first robot cuts the skin and bordering tissues, leaving clean the path for two discs located in a convergent position that act on the spine but without cutting it. The function of this blade is to separate the meat from the intervertebral spaces. Finally, another cutting disc located on the upper arm of the second robot performs the cut from top to bottom of the spine, at which time the body of the slaughtered animal is divided into two substantially equal halves, returning them so that they can be moved on by the carousel.

[0019] In an alternative embodiment, not according to the present invention, the system can perform the same process by means of a single robot instead of two robots, for which purpose the first robot equips its last arm with a support, and the means used by the first and second robots described above hang at one of the ends of the support.

[0020] All of the robots used in both of the disclosed embodiments of the invention preferably have six degrees of freedom.

[0021] Other details and characteristics will become apparent during the course of the description given below, which for illustrative purposes are represented in the figures accompanying an embodiment of the invention, which can be carried out with any type of measures and materials suitable for its purposes.

Description of the figures

[0022] Below is a list of the different parts of the invention that are identified in the figures attached to this description by means of the numbers listed below, 10 cutting device, 11 first robot, 12 second robot, 13 pedestal, 14 ground plane, 15 support base, 16 support base, 17 lower arm, 18 upper arm, 19 shaft, 20 shaft, 21 arm, 22 probe cutter head, 23 probe cutter head, 24 disc, 25 probe, 26 rollers, 27 rollers, 28 pistons, 29 circular blade, 30 shaft, 31 link, 32 connecting rod, 33 connecting rod, 34 support, 35 blades, 36 arm, 37 shaft, 38 support.

Figure no. 1 shows a vertical side view of the cutting device 10 comprising two robots 11 and

12 which are facing each other and immobilised to the ground plane 14 thanks to pedestals 13.

Figure no. 2 shows an enlarged view of the upper part of the robot 11 and of the head 22 composed of prober and cutter means.

Figure no. 3 shows a vertical front view of the robot 11 mounted thanks to the pedestal 13 in the ground plane 14, equipped with a head 22 acting either by means of the rollers 27, or by rotating the same 22 with the blades 35.

Figure no. 4 shows a vertical side view of the enlarged second robot 12, equipped with a head 23, equipped with a cutting disc 24 and a prober 25, equipped with rollers 26.

Figure no. 5 shows a vertical front view of the second robot 12 and the head 23 equipped with a cutting disc 24 and a probe 25.

Description of an embodiment of the invention

[0023] In one of the embodiments of the invention, and as can be seen in figure no. 1, the assembly of the cutting device 10 comprises the following, mounted on a horizontal ground plane 14: two robots 11 and 12 on respective pedestals 13, which are facing each other 11 and 12 by the cutting and palpating means, leaving a space or volume between them for a carousel to circulate with the animals to be treated properly suspended by their legs and skinned.

[0024] On this pedestal, the first robot 11 comprises 13 a support base 15 and on said support base 15 there are two separate arms 17-18 angled by their respective shafts 30-19, with the following mounted on the end of the upper arm 18: a head 22 equipped with palpation and cutting means incorporated into a support 34 comprising control means that allow the programmed rotation of the support 34 making it spin and positioning either one or the other means (palpation or cutting means) according to the work assigned to the first robot 11.

[0025] The cutting means of the first robot (11) when the animal is facing the first robot 11 and its head 22 are blades 35, and a circular blade or cutting disc 29, mounted on the connecting rods 33, while the palpation or guiding means comprise probe rollers 27 mounted on the lower part of the connecting rods 32.

[0026] In this particular case shown in the figures, two pairs of probe rollers 27 are arranged, which tilt according to the dorsal morphology of the sacrificed animal via motion means that adapt to each specific animal morphology. These motion means preferably comprise connecting rods 32 and pistons 28.

[0027] In other words, in order to preferably adapt to the morphology of the animal, the connecting rods 33 and 32 of the first robot 11 adapt to the rotating movement by means of the

pistons 28, as can be seen in figures 1 and 2.

[0028] The second robot 12 comprises, on said pedestal 13, a support base 16 and respective arms 36, 21 linked by the respective shafts 37, 20, with a head 23, equipped with palpation and cutting means incorporated in a support 38 being mounted on the end of the arm 21, see figure 4.

[0029] The two robots may be used to do the following work possibilities:

- The first possibility is: the first robot 11 working with the probe rollers (27), holding an animal by the dorsal part by means of the probe rollers 27 mounted on the head 22, when the second robot 12 cuts it via the ventral area by means of the cutting disc 24, in line with the morphology of the animal, thanks to the probe rollers 26.
- The second possibility is: the first robot 11 turns 180° to the support 34 and, the blades 29 so that turns to work in this position with the blades 35 and 29, acting on the dorsal part of the animal, cutting the skin and cleaning the meat from the intervertebral areas, while the head 23 of the second robot 12 performs a cut in the spine for the ventral part, helping by the probe rollers 25, 26.

[0030] With this device, the possibilities for manipulating the animals that circulate through the carousel in the space between the two robots 11 and 12 are those described in the previous paragraph, by simply programming the position of the head 22 so that it acts as a guide and supports the robot 12 when it cuts the animal ventrally in two, or when the animal is dorsally and ventrally cut simultaneously. While at present in order to exercise the functions tasked to the robot 11 three robots would be required, resulting in a longer time and an additional robot, and more energy to provide electromotive force to three robots, the device described in the invention only needs two robots, plus a maintenance greater than 50% corresponding to the additional robot that is used in related devices known and used up to the present.

[0031] Having sufficiently described the present invention in correspondence with the appended figures, it is easy to remember that any detail modifications that may be appropriate may be introduced therein, without departing from the scope of the invention as defined in the appended claims.

REFERENCES CITED IN THE DESCRIPTION

Cited references

This list of references cited by the applicant is for the reader's convenience only. It does not

form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- FR2923357 [0003]
- EP494935A [0005]

Patentkrav

- 1.** Indretning til at udføre frontal og dorsal skæring af en svineslagtekrop, **kendetegnet ved, at** indretningen omfatter to robotter (11, 12), der er placeret frontalt henholdsvis foran og bagved et organ til transport af
- 5 de aflivede dyr, ophængt ved hjælp af passende krogeorgan eller lignende, der danner en form for vertikalt plan i en karrusel hvori:
- den første robot (11), indrettet til at blive placeret modsat dyrets dorsale plan, omfattende:
 - føleorganer (27) til organ til at skære rygsøjlen i to, placeret i den
 - 10 anden robot (12),
 - organer til dorsal skæring af huden og væv, der grænser op til nævnte hud (35),
 - organer til dorsal skæring og rensning af kød fra dyret i de intervertebrale mellemrum (29), og
 - 15 - en leddelt arm (17, 18), der omfatter respektive to arme (17, 18) vinklet af respektive aksler (30, 19), til positionering og bevægelse af organerne til dorsal skæring af huden og væv, der grænser op til nævnte hud (35) og organerne til dorsal skæring og rensning af kød fra dyret i de intervertebrale mellemrum (29); og
 - 20 - et hoved (22) monteret på enden af den leddelte arms (17, 18) overarm (18), hvor hovedet (22) er udstyret med en støtte (34), og hvor støtten (34) omfatter skæreorganerne (35, 29) og føleorganerne (27); og
 - hvor støtten (34) omfatter styreorganer, der tillader en
 - 25 programmeret rotation af støtten (34), hvilket får den til at dreje og placere enten føleorganerne (27) eller skæreorganerne (35, 29) i overensstemmelse med det arbejde, der er tildelt den første robot (11); og
 - den anden robot (12), placeret foran dyrets ventrale plan, omfattende:
 - 30 - føleorganer (26) til den ventrale del af dyret,
 - organer til at skære rygsøjlen (24) ved dens centrale del,
 - en leddelt arm (21, 36) til positionering og bevægelse af føleorganerne (26) og organerne til at skære rygsøjlen (24);

og hvor bevægelsen af den leddelte arm (17, 18) af den første robot (11) til udskæringen i den dorsale del, der adskiller kødet fra mellemrummet mellem ryghvirvlerne, og bevægelsen af den leddelte arm (21, 26) af den anden robot (12) til udskæring af rygsøjlen i den ventrale del er samtidig.

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2. Indretningen ifølge krav 1, hvor begge robotter (11, 12) har seks frihedsgrader.

3. Indretningen ifølge krav 1, hvor føleorganerne (27) af den første robot (11) omfatter to par proberuller (27), som vipper alt efter den dorsale morfologi af det aflivede dyr ved hjælp af bevægelsesorganer.

4. Indretningen ifølge krav 3, hvor bevægelsesorganerne omfatter forbindelsesstænger (32) styret af to stempler (28), der forbinder hovedets støtte (34) og nævnte forbindelsesstænger (32).

5. Indretningen ifølge krav 1, hvor skærehovedet (22) af den første robot (11) omfatter forbindelsesstænger (32, 33) vinklet i den ene ende i støtten.

6. Indretningen ifølge krav 1, hvor skæreorganerne til huden og tilstødende væv i det dorsale område i den første robot (11) omfatter en cirkulær klinge (29).

7. Indretningen ifølge krav 1, hvor organerne til skæring og rensning af dyrets kød i de intervertebrale mellemrum i det dorsale område installeret i den første robot (11) omfatter klinger (35).

8. Indretningen ifølge krav 7 og 8, hvor konvergensen af klingerne (29, 35) er justerbar i overensstemmelse med morfologien af det slagtede dyr på en fuldautomatisk måde.

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9. Indretningen ifølge krav 1, hvori hovedets føle- og skæreorganer inkorporeret i den første robot (11) anvendes selektivt og automatisk programmeret ved at rotere støtten, på hvilken organerne er immobiliseret.

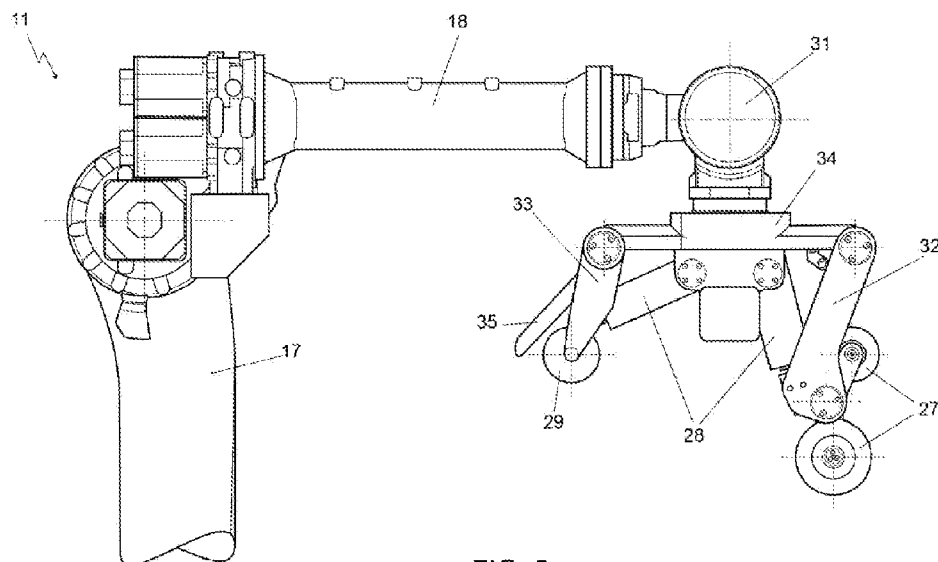
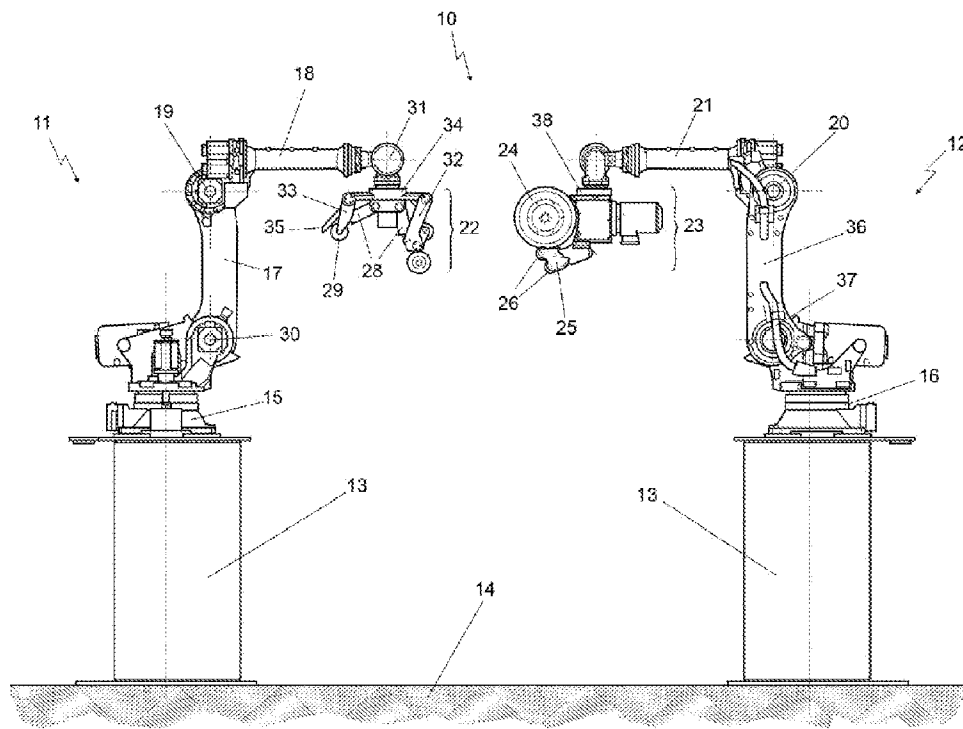
10. Indretningen ifølge krav 1, hvor den leddelte arm (21, 26) af den anden robot (12) omfatter respektive arme (36, 21) vinklet af de respektive aksler (37, 20), med et hoved (23) udstyret med føle- og skæreorganerne inkorporeret i en støtte (38), der er monteret på enden af armen (21).

5

11. Indretningen ifølge krav 1 og 11, hvor organerne til at føle og skære dyrets rygrad af hovedet (23) af den anden robot (12) omfatter en skæreskive (24), der er hjulpet af proberuller (26).

10 **12.** Indretningen ifølge krav 1, hvor støtten (34) af den første robot (11) drejer en programmeret rotation på 180° for at kunne arbejde i de to forskellige positioner.

DRAWINGS



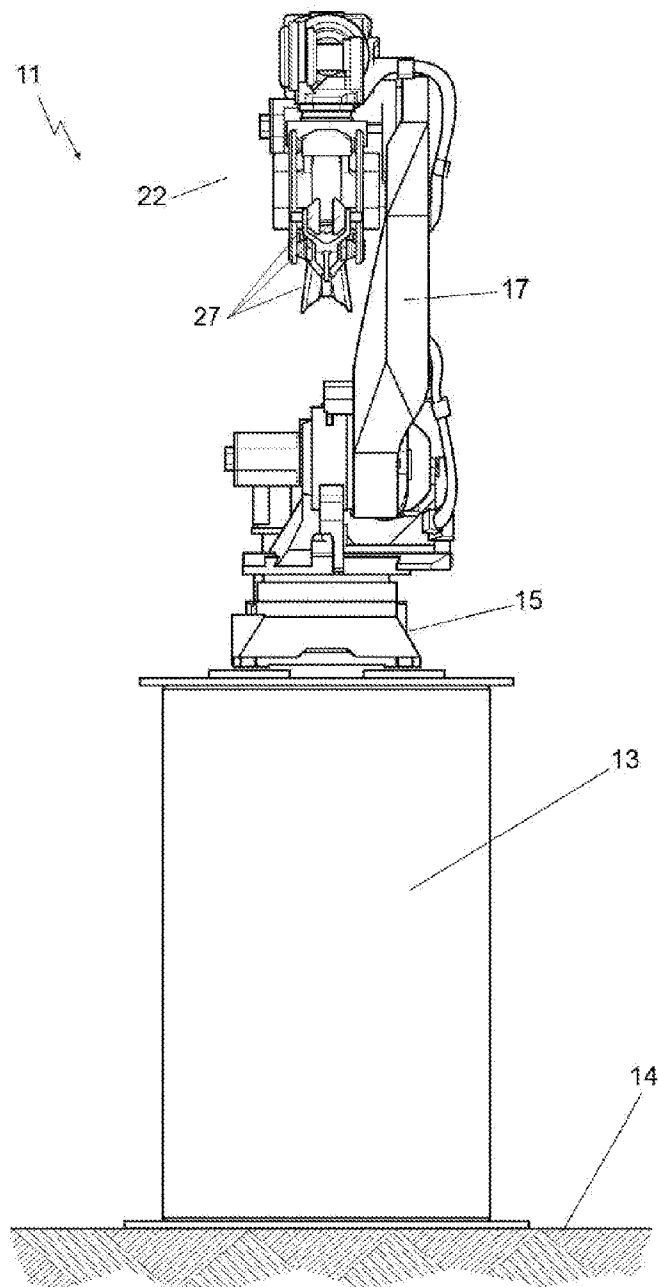


FIG. 3

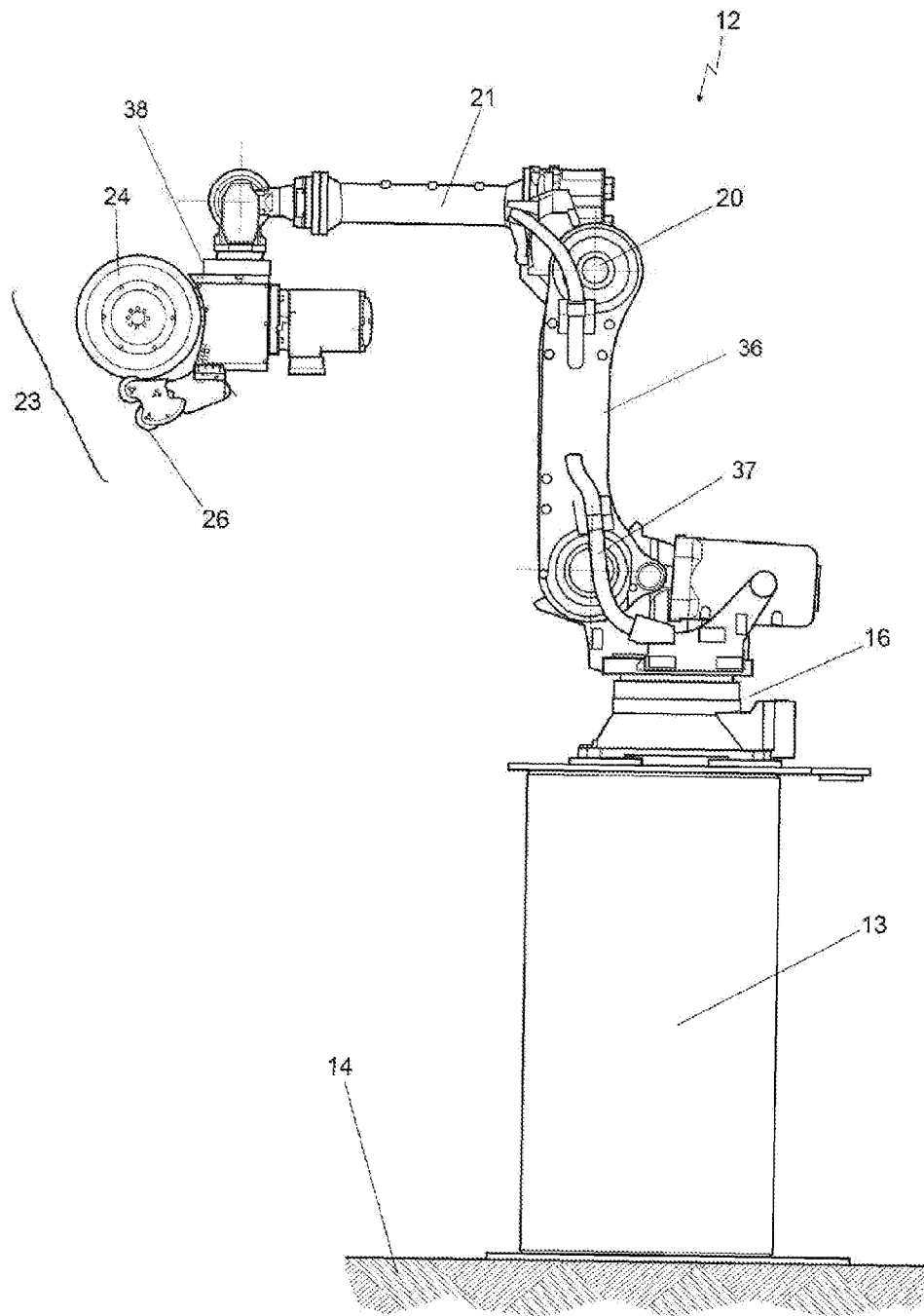


FIG. 4

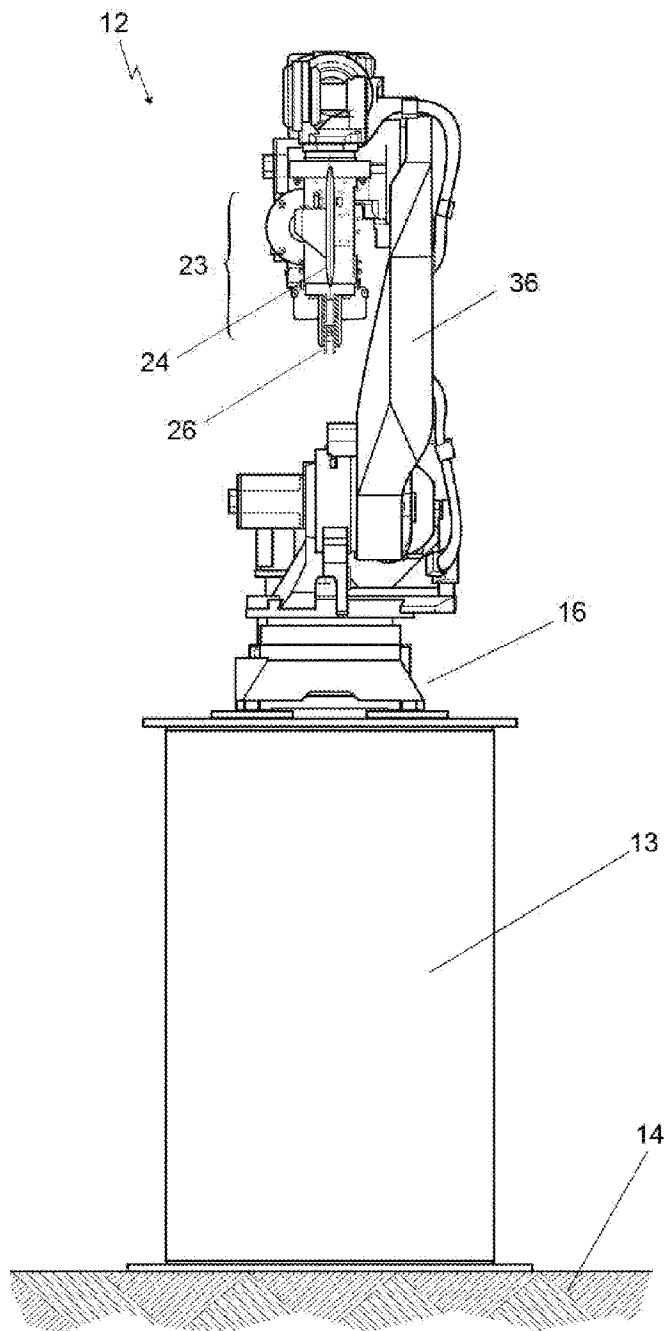


FIG. 5