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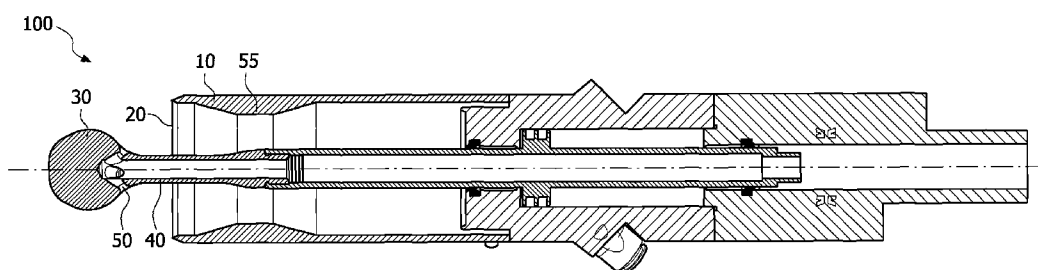
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(54) Title: METHOD AND DEVICE FOR SEPARATING THE ANUS AND AT LEAST A PART OF THE RECTUM FROM A CARCASS



(57) Abstract: The invention relates to a method and a device for separating the anus and at least a part of the rectum from a carcass, comprising of: aligning a core of a separating device with the anus of the slaughtered animal; introducing the core of the separating device at least partially into the anus; separating the anus and at least a part of the rectum from the carcass using the cylindrical knife; characterized in that the knife rotates alternately to the left and to the right during the separation.



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Method and device for separating the anus and at least a part of the rectum from a carcass

5 The present invention relates to a method and device for separating the anus and the rectum from a carcass. The present invention also relates to a method and device for severing a tissue part between an opened part of a carcass and a part separated from the carcass. The present invention further relates to a method and device for removing from a carcass an anus and rectum separated from the carcass.

10 The processing of carcasses of slaughtered animals, such in particular pigs, sheep and cattle, generally comprises of opening, also referred to as cleaving, the pubic bone of the carcass and simultaneously arranging a first opening in the abdomen, separating the anus and the rectum from the carcass, fully opening the belly and breast and then removing the entrails through the opened belly. When the anus and at least a part of the
15 rectum are released from the carcass, it is known in the prior art to make use of a vent cutter comprising a rotatable cylindrical knife provided with a core which is centered relative to the rotatable cylindrical knife. Such a vent cutter is described in, among others, the European patent 1 027 829.

20 In the described art the core is first of all aligned with the anus and subsequently introduced at least partially into the rectum. Alignment can take place here with optical recognition means ("vision"). After insertion of the core and placing of a cylindrical knife into contact with the skin around the anus, the correct positioning of the cutting means can be tested with an underpressure device connecting to the interior of the
25 cylindrical knife. If the cutting means are positioned correctly, an underpressure occurs in the cylindrical knife and this can be determined by measurement. In the case of incorrect alignment no underpressure occurs in the cylindrical knife.

30 As soon as correct positioning has been determined, the anus and at least a part of the rectum is detached (separated) from the carcass by rotating and introducing the cylindrical knife into the carcass. As soon as the cylindrical knife has been carried sufficiently into the carcass, and the anus has been drawn sufficiently deeply into the cylindrical knife because of the underpressure, the core which has likewise penetrated further into the carcass is withdrawn into the cylindrical knife. By moving a thickened

outer end of the core to a position close to a constriction in the interior of the cylindrical knife the anus is thus secured in the cylindrical knife; at least if the thicker anus can no longer be moved between the constriction in the cylindrical knife and the inward moved thickened end of the core. In this position the rectum is held on the side of the anus in
5 the cylindrical knife.

After separation the separating device is once again removed from the carcass in the direction in which it was introduced into the carcass such that the anus and a part of the rectum can be transferred on the backside (buttock side) of the carcass from the
10 cylindrical knife into a holder. Later in the slaughtering process the anus with attached rectum is carried manually to the abdominal side of the carcass, following which the entrails are removed through the abdominal opening.

Detaching the anus and at least a part of the rectum from a carcass functions in practice
15 according to the prior art. A number of aspects can however be improved; the problem, among others, that during or after release of the anus excreta from the anus regularly drops onto the carcass. Another drawback of the prior art is that, after the release of the anus and a part of the rectum from the carcass with the cylindrical knife, subsequent operations usually have to be performed manually.

20 The present invention has for its object to provide an improved method and device of the type stated in the preamble with which the chance of contamination of a carcass of a slaughtered animal during separation of the anus is reduced and with which a subsequent mechanical/automatic processing of carcasses is made possible in efficient
25 manner.

The invention provides for this purpose a method for separating the anus and the rectum from a carcass, comprising of: aligning a core of a separating device with the anus of the slaughtered animal; introducing the core of the separating device at least partially
30 into the anus; separating the anus and the rectum from the carcass using the cylindrical knife; characterized in that the knife rotates alternately to the left and to the right during the separation. The method comprises of aligning a core of a separating device in a known manner with the anus of the carcass. The anus and a part of the rectum are subsequently separated from the carcass by rotation of the cylindrical knife, wherein

according to the present invention however the knife rotates alternately to the left and to the right during the separation. Owing to the alternate cutting to the left and right the rectum is not rotated (twisted). Twisting can occur when the cylindrical knife rotates in a single direction as in the prior art. Not twisting the rectum reduces the chance of the
5 content of the rectum, i.e. excreta, being placed under pressure and thereby being forced outward. One of the advantages of the alternating rotation of the cylindrical knife to the left and right is that no, or only limited, forces are exerted on the rectum, whereby the rectum will hardly twist at all. The volume of the rectum will thus not change, with the advantage that not twisting significantly reduces the chance of excreta coming out of the
10 anus. Alternating rotation to the left and right also reduces the chance of damage to the rectum, thereby also reducing the chance of the release of excreta. It is possible after one or more rotations of the cylindrical knife to change the direction of rotation, although it has also been found advantageous to rotate the knife alternately to the left and to the right through an angular rotation between 10 and 350 degrees, preferably an
15 angular rotation between 30 and 150 degrees, and more particularly with an angular rotation of about 90 degrees. The most suitable angular rotation can be determined here subject to the situational conditions. Important factors here, among others, are the firmness of the tissue around the anus and whether or not a tothing is present on the cutting edge of the cylindrical knife.

20

The invention also provides a device for separating the anus and the rectum from a carcass, comprising a cylindrical knife rotatable by means of a drive and a core centered relative to the cylindrical knife, wherein the drive is adapted such that it is suitable for driving at least the cylindrical knife alternately to the left and to the right. The drive of
25 the knife is adapted here such that it drives the knife alternately to the left and to the right with an angular rotation between 10 and 350 degrees, this being possible for instance with a crankshaft drive wherein the input drive shaft of the device has a smaller diameter than the driven shaft. For the advantages of applying such a device reference is made to the advantages already mentioned in the foregoing of the above described
30 method according to the present invention. In addition, it is possible to convert an existing device for separating the anus from a carcass (vent cutter) with minimal effort to a vent cutter rotating alternately to the left and to the right.

The present invention further provides respectively a method and device for performing the method for severing a tissue part located between an opened pubic area of a carcass and an opening in the carcass arranged around the anus, wherein the opened part of the pubic area passes through the pubic bone of the carcass, characterized in that severing
5 of the tissue part is carried out in a continuous movement with penetration into the carcass of a cylindrical knife with which the anus and at least a part of the rectum is separated from the carcass. Severing of the tissue part has the advantage of enabling the removal of the separated entrails (or a part thereof) directly to the abdominal side. Penetration of the cylindrical knife into the carcass in a continuous movement for the
10 purpose of severing the tissue has the advantage that processing of the carcass can take place more quickly. A device for performing the method can for instance be characterized by an additional knife coupled to the separating device such that the projection of a cutting edge of the additional knife onto a plane lying substantially perpendicularly of the centre line of the cylindrical knife connects the cut around the
15 anus defined by the cylindrical knife to the opened pubic area.

perpendicularly of the centre line of the cylindrical knife connects the cut around the anus defined by the cylindrical knife to the opened pubic area.

20

Instead of being carried out to the usual distance of 5 to 10 centimetres from the anus, the opening pretreatment can hereby take place to 1-5 centimetres from the anus, and in particular to 2-3 centimetres from the anus, for the purpose of enabling simple severing of the tissue with an additional knife. A minimum distance of for instance 2 to 3
25 centimetres is desirable for the purpose of enabling efficient verification of the alignment of the cylindrical knife on the basis of an underpressure. Because the tissue part around the anus is not fully severed, the cylindrical knife can connect gas-tightly onto the carcass. When severing is continued to a smaller distance from the anus, there is the chance that the underpressure cannot be developed since the severing then allows
30 supply of air into the cylindrical knife.

In order to guarantee complete severing in a subsequent step of the tissue part located between an opened pubic area and the opening in the carcass arranged around the anus, it is desirable that the outer side of the jacket of the cylindrical knife is provided with a

substantially annular undercut in which an outer end of the cutting edge of the additional knife is located. A cut made by the additional knife will hereby always connect onto the cut made by the cylindrical knife.

- 5 The present invention further provides a method for removing from a carcass an anus and at least a part of the rectum separated from the carcass, wherein the method comprises of engaging the anus and at least a part of the rectum separated from the carcass with a cylindrical knife of a separating device, and the anus and rectum engaged with the cylindrical knife are moved by the separating device to the abdominal side of
10 the carcass. The separated anus and at least a part of the rectum are here preferably released from the cylindrical knife on the abdominal side of the carcass and are secured in a position located a distance from the carcass. The anus with at least a part of the rectum is thus displaced to the abdominal side in a shielded position (since they are accommodated in the cylindrical knife). The chance of contaminating the carcass by
15 means of excreta leaving the anus is hereby considerably reduced compared to the prior art. This is because the unprotected displacement of the detached anus from the backside to the breast side results in an increased chance of contamination. A further advantage is that this method is very efficient; the anus engaged for the purpose of release does not have to be engaged again for a second time. This saves time and
20 reduces the chance of errors.

- In a particular embodiment variant of this method the rectum secured on the abdominal side and at a distance from the carcass is co-displaced with displacement of the carcass. The carcasses are usually moved along a transport path through a production location;
25 the detached anus can thus be co-displaced until a processing station is reached where the entrails are separated from the carcass. The necessity of securing the anus at this position is also dispensed with.

- The invention further also provides a device for taking out of a carcass an anus and at
30 least a part of the rectum separated from the carcass, comprising a separating device provided with a cylindrical knife for separating the anus and at least a part of the rectum from the carcass, which separating device is adapted to secure the anus and the rectum in the cylindrical knife, characterized in that the cylindrical knife is displaceable to the abdominal side of the carcass. In a particular preferred variant the cylindrical knife is

herein carried by a knife holder displaceable between the legs of the carcass. Using such a device the advantages can be realized as described above with reference to the method wherein the anus and rectum engaged with the cylindrical knife are moved by the separating device to the abdominal side of the carcass.

5

A device according to the present invention can advantageously also be configured in that the device comprises securing means located on the abdominal side of the carcass for holding the anus and rectum released from the cylindrical knife. These securing means can further be embodied such that they are displaceable parallel to a transport
10 path for the carcasses. These measures also contribute toward a further decrease in the chance of contamination of the carcass. The securing means which make it possible to displace the anus parallel to a transport path for the carcasses can for instance consist of clamping elements displaceable along a guide or of a guide engaging directly on a detached anus, for instance in the form of two parallel guide rods located a short
15 distance from each other.

The invention also relates to a combined method for processing a carcass, comprising at least two of the methods according to the respective claims 1-2, 5-7 and 10-12, and to a combined device for processing a carcass comprising at least two of the devices
20 according to the respective claims 3-4, 8-9, 13-16.

The invention will be further elucidated on the basis of non-limitative exemplary embodiments shown in the following figures. Herein:

- figure 1A shows a section of a part of a separating device according to a first
25 embodiment of the present invention in a first position;
figure 1B shows a section of a part of a separating device according to a first embodiment of the present invention in a second position;
figure 1C shows a drive of a separating device according to a first embodiment of the present invention;
30 figure 2 is a perspective view of a device according to a second embodiment of the present invention;
figure 3A is a perspective view of a device according to a third embodiment of the present invention in a first position;

figure 3B is a perspective view of a device according to a third embodiment of the present invention in a second position;

figure 3C is a perspective view of a device according to a third embodiment of the present invention in a third position;

5 figure 3D is a perspective view of a device according to a third embodiment of the present invention in a fourth position;

figure 3E is a perspective view of a device according to a third embodiment of the present invention in a fifth position.

10 Figure 1A shows a section of a part 100 of the separating device according to a first embodiment of the present invention in a first position. The device comprises a cylindrical knife 10 with a circular cutting edge 20 in which is situated a core 30 placed axially relative to cylindrical knife 10. Core 30 is thus located on a axis 40. Core 30 can herein be displaced in the axial direction of axis 40. In the vicinity of a connection of
15 core 30 to axis 40 openings of a vacuum device 50 are arranged for the purpose of verifying a correct alignment relative to the anus in simple manner by means of whether or not underpressure is present in cylindrical knife 10. Core 30 is situated in a position outside cylindrical knife 10. In this position the separating device 100 can be aligned relative to the anus, and core 30 can be introduced partially into the anus. As soon as
20 cylindrical knife 10 has been partially introduced into the anus, core 30 can be retracted into the cylindrical knife. Introducing cylindrical knife 10 into the carcass herein takes place while knife 10 is rotated alternately to the left and right by means of for instance the drive which will be further elucidated in figure 1C.

25 Figure 1B shows device 100 of figure 1A, wherein core 30 has been retracted into cylindrical knife 10. The anus of the carcass is here secured between core 30 and a constriction 55 on the inner side of cylindrical knife 10. In this position the chance of excreta exiting from the rectum is extremely small, and device 100 can be taken with the anus and the rectum out of the carcass, and the anus is moreover shielded from the
30 carcass by cylindrical knife 10.

Figure 1C shows an exemplary embodiment of a drive which can be applied on device 100 of figures 1A and 1B. The drive comprises a motor 60, for instance an electric motor, for driving a first wheel 80. First wheel 80 is connected via a crankshaft 90 to a

second wheel 85 which is connected to a drive shaft 95 for driving the device 100. A crankshaft 90 is connected to first wheel 80 at a first radius 120 which is smaller than the second radius 130 at which the drive rod 90 is connected to second wheel 85. When first wheel 80 makes a first angular rotation 140, second wheel 85 hereby makes a second angular rotation 150 which is smaller than the first angular rotation 140. In the shown configuration the angular rotation of second wheel 85 will always be smaller than a full rotation, even when the first wheel 80 makes one or more complete rotations. In the shown configuration the angular rotation of second wheel 85 amounts to about 90 degrees. Depending on the chosen ratio between the first radius 120 and the second radius 130 the rotation can be adjusted to a value desired for a specific tissue.

Figure 2 shows a device 200 according to a second embodiment of the present invention. Shown once again is a core 210 which is centered in a cylindrical knife 215 with a cutting edge 220. The device can herein be driven with the drive (not shown) of figure 1C. Arranged adjoining the jacket 230 of cylindrical knife 215 is an additional knife 250 which serves to sever a tissue part between an opened part of a carcass to be processed by the device and a part comprising the anus and the rectum separated from this carcass. A cutting-edge 260 of the additional knife 250 extends in radial direction relative to the cylinder jacket 230 of the cylindrical knife. The additional knife 250 is connected to a non-rotating fixed part 280 of device 200, whereby it does not co-rotate with cylindrical knife 230. In figure 2 there is arranged in cylinder jacket 230 of cylindrical knife 215 a substantially annular undercut 240 in which an outer end 270 of cutting edge 260 of additional knife 250 is received. This prevents tissue not been cut because it is carried between the flat knife 250 and cylindrical knife 215. The additional knife 250 provides the advantage that no manual processing or separate automated processing need take place, and makes it possible for the separated anus and rectum to be carried away to the abdominal side of the carcass, with the advantage that there is little risk of excreta falling onto the carcass.

Figure 3A shows a device 300 according to a third embodiment of the present invention in a first position. A separating device (for instance the device 200 of figure 2) with an additional knife for severing the tissue between an opened pubic bone and a detached anus, is herein positioned by means of an arm 310 in a position at the level of the anus

of carcass 330. The carcass is carried along device 300 by a transporting device 340 which does not per se form part of the present invention.

Figure 3B shows device 300 in a second position subsequent to the position as shown in
5 figure 3A, in which device 300 is carried partially into carcass 330 on the backside 360. Device 300 is rotated alternately to the left and right around the anus and the rectum. The tissue between the cut cleaving the pubic bone and the separation of the anus and the rectum is thus severed.

10 Figure 3C shows device 300 in a third position subsequent to the position of figure 3B, wherein after separation of the anus and the rectum severing of the remaining tissue between the opening of the pubic bone and the anus is carried out on the abdominal side 350 of carcass 330. The anus and the rectum are here secured by separating device 300.

15 Figure 3D shows device 300 of figures 3A-3C in a fourth position subsequent to the position of figure 3C, in which the separated anus and rectum (not shown) are placed in a holder 370 which is co-displaced with carcass 330 over a rail 375.

Figure 3E shows device 300 of figures 3A-3D in a fifth position subsequent to the
20 position as illustrated in figure 3D, wherein a part of separating device 300 is placed in a cleaning device so as to be thus cleaned before once again running through the first to the fourth positions for a subsequent carcass 390 for processing.

Claims

1. Method for separating the anus and the rectum from a carcass, comprising of:
 - aligning a core of a separating device with the anus of the slaughtered animal;
- 5 - introducing the core of the separating device at least partially into the anus;
 - separating the anus and the rectum from the carcass using the cylindrical knife;**characterized in that** the knife rotates alternately to the left and to the right during the separation.
- 10 2. Method as claimed in claim 1, wherein rotation of the knife alternately to the left and to the right takes place through an angular rotation between 10 and 350 degrees.
3. Device for separating the anus and the rectum from a carcass, comprising:
 - a cylindrical knife rotatable by means of a drive; and
- 15 - a core centered relative to the cylindrical knife,
characterized in that the drive is adapted to drive at least the cylindrical knife alternately to the left and to the right.
4. Device as claimed in claim 3, wherein the drive drives the knife alternately to the
- 20 left and to the right with an angular rotation between 10 and 350 degrees.
5. Method for severing a tissue part located between an opened pubic area of a carcass and an opening in the carcass arranged around the anus, wherein the opened part of the pubic area passes through the pubic bone of the carcass,
- 25 **characterized in that** severing of the tissue part is carried out in a continuous movement with the action of penetrating into the carcass of a knife with which the anus and at least a part of the rectum is separated from the carcass.
6. Method as claimed in claim 5, wherein prior to the severing of the tissue part the
- 30 pubic area is opened to a distance of 1 to 5 centimetres from the anus.
7. Method as claimed in claim 6, wherein prior to the severing of the tissue part the pubic area is opened to a distance of 2 to 3 centimetres from the anus.

8. Device for severing a tissue part located between an opened pubic area of a carcass and an opening in the carcass arranged around the anus, wherein the opened part of the pubic area passes through the pubic bone of the carcass, comprising a separating device provided with a substantially cylindrical knife rotatable by a drive for separating
5 the anus and at least a part of the rectum from the carcass,
characterized by an additional knife coupled to the separating device such that the projection of a cutting edge of the additional knife onto a plane lying substantially perpendicularly of the centre line of the cylindrical knife connects the cut around the anus defined by the cylindrical knife to the opened pubic area.
- 10
9. Device as claimed in claim 8, **characterized in that** the outer side of the jacket of the substantially cylindrical knife is provided with a substantially annular undercut in which an outer end of the cutting edge of the additional knife is located.
- 15
10. Method for removing from a carcass an anus and at least a part of the rectum separated from the carcass, comprising of engaging the anus and at least a part of the rectum separated from the carcass with a cylindrical knife of a separating device, **characterized in that** the anus and rectum engaged with the cylindrical knife are moved by the separating device to the abdominal side of the carcass.
- 20
11. Method as claimed in claim 10, **characterized in that** the separated anus and at least a part of the rectum are released from the cylindrical knife on the abdominal side of the carcass and are secured in a position located a distance from the carcass.
- 25
12. Method as claimed in claim 11, **characterized in that** the rectum secured on the abdominal side and at a distance from the carcass is co-displaced with displacement of the carcass.
- 30
13. Device for taking out of a carcass an anus and at least a part of the rectum separated from the carcass, comprising a separating device provided with a cylindrical knife for separating the anus and at least a part of the rectum from the carcass, which separating device is adapted to secure the anus and the rectum in the cylindrical knife, **characterized in that** the cylindrical knife is displaceable to the abdominal side of the carcass.

14. Device as claimed in claim 13, **characterized in that** the cylindrical knife is carried by a knife holder displaceable between the legs of the carcass.
- 5 15. Device as claimed in claim 14, **characterized in that** the device comprises securing means located on the abdominal side of the carcass for holding the anus and rectum released from the cylindrical knife.
- 10 16. Device as claimed in claim 15, **characterized in that** the securing means are displaceable parallel to a transport path for the carcasses.
17. Combined method for processing a carcass, comprising at least two of the methods as claimed in the respective claims 1-2, 5-7 and 10-12.
- 15 18. Combined device for processing a carcass, comprising at least two of the devices as claimed in the respective claims 3-4, 8-9, 13-16.

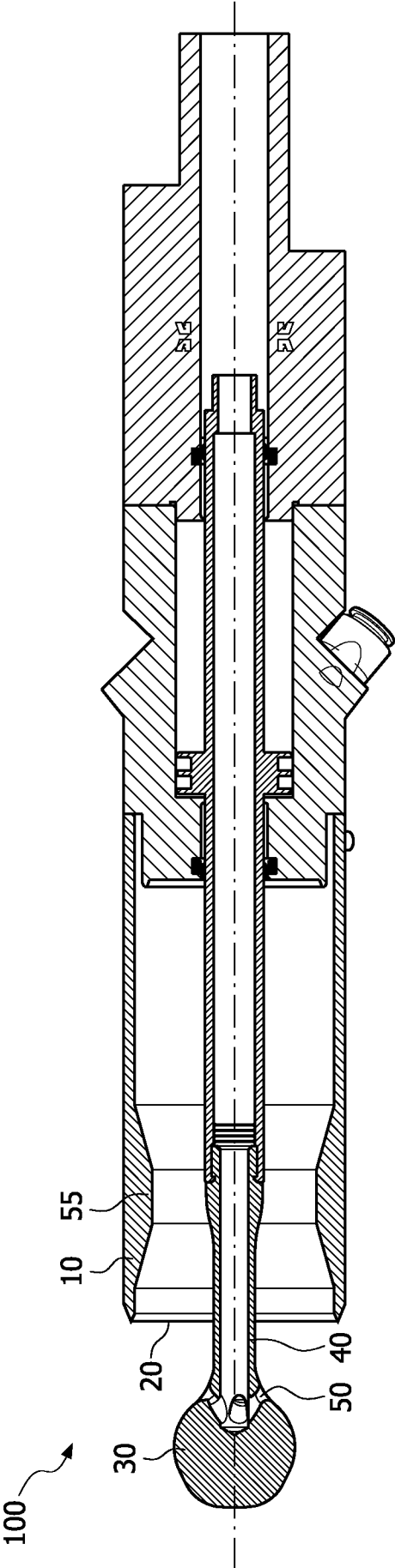


FIG. 1A

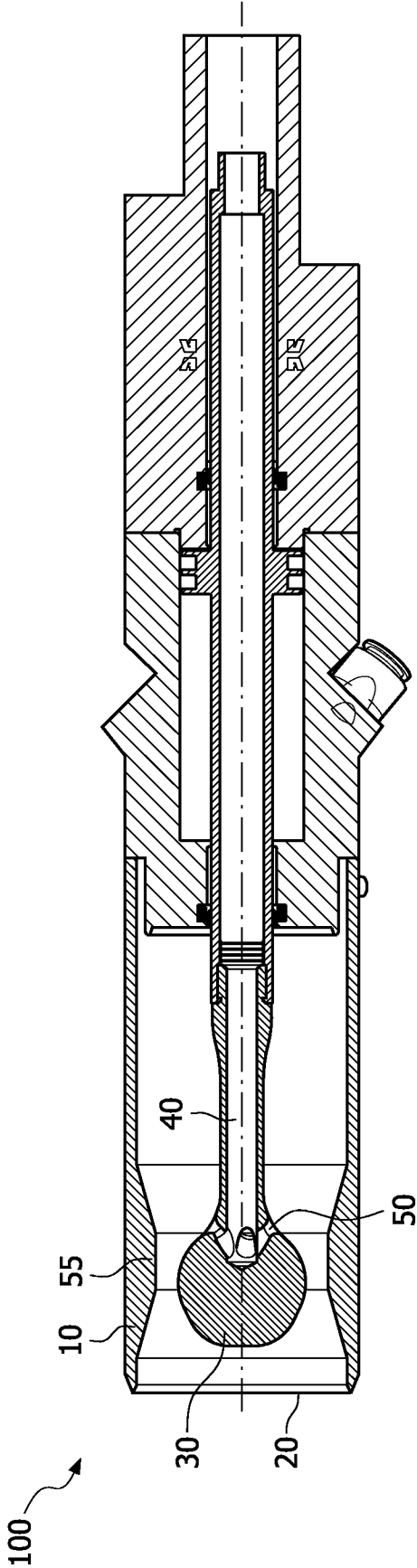


FIG. 1B

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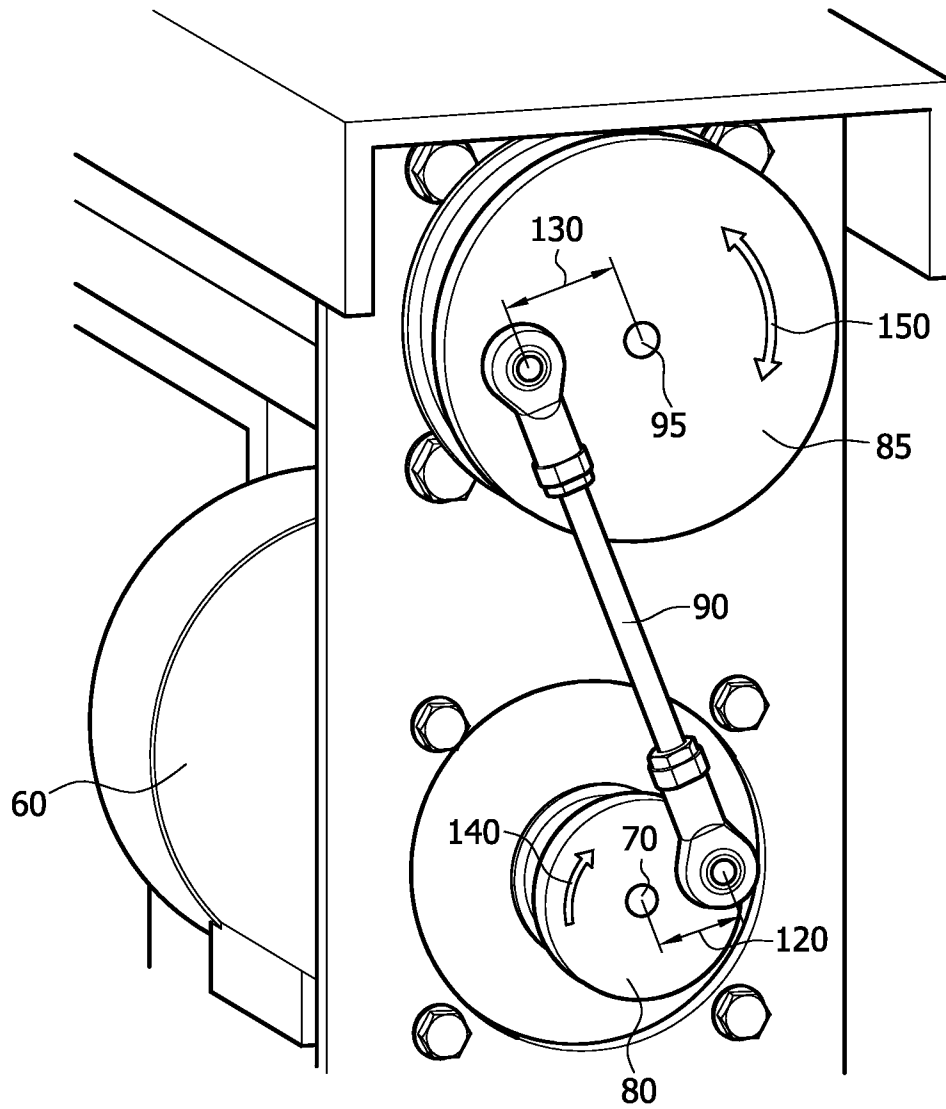


FIG. 1C

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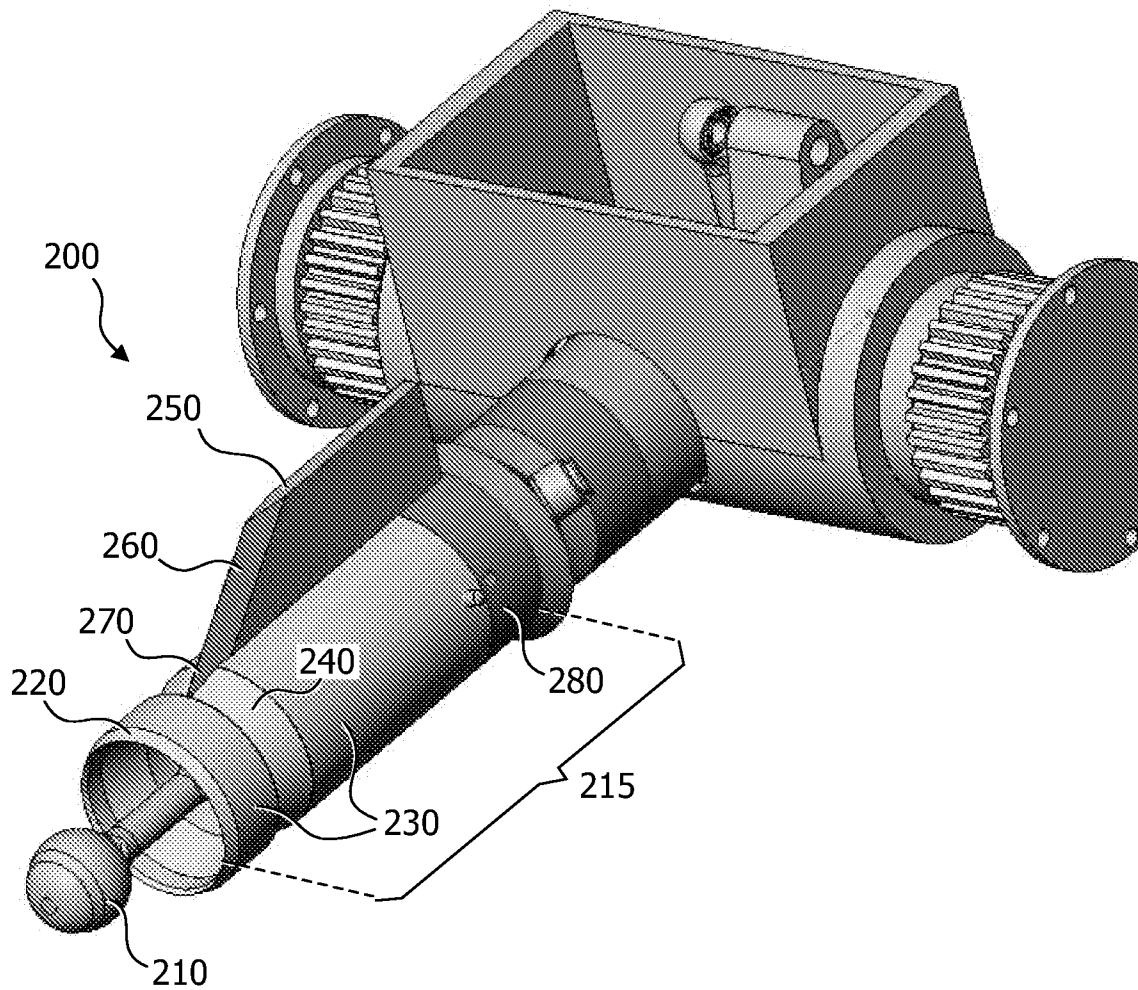


FIG. 2

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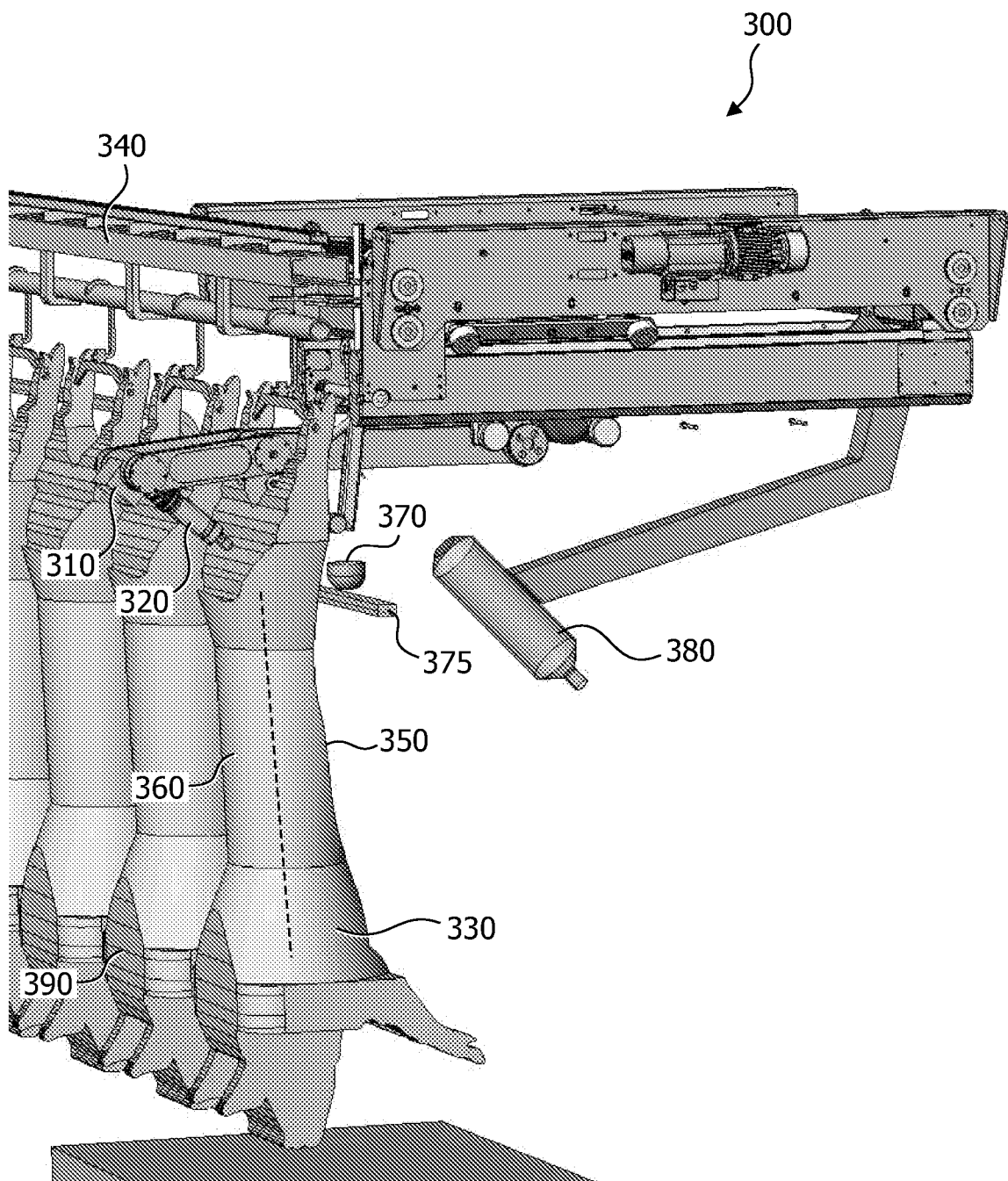


FIG. 3A

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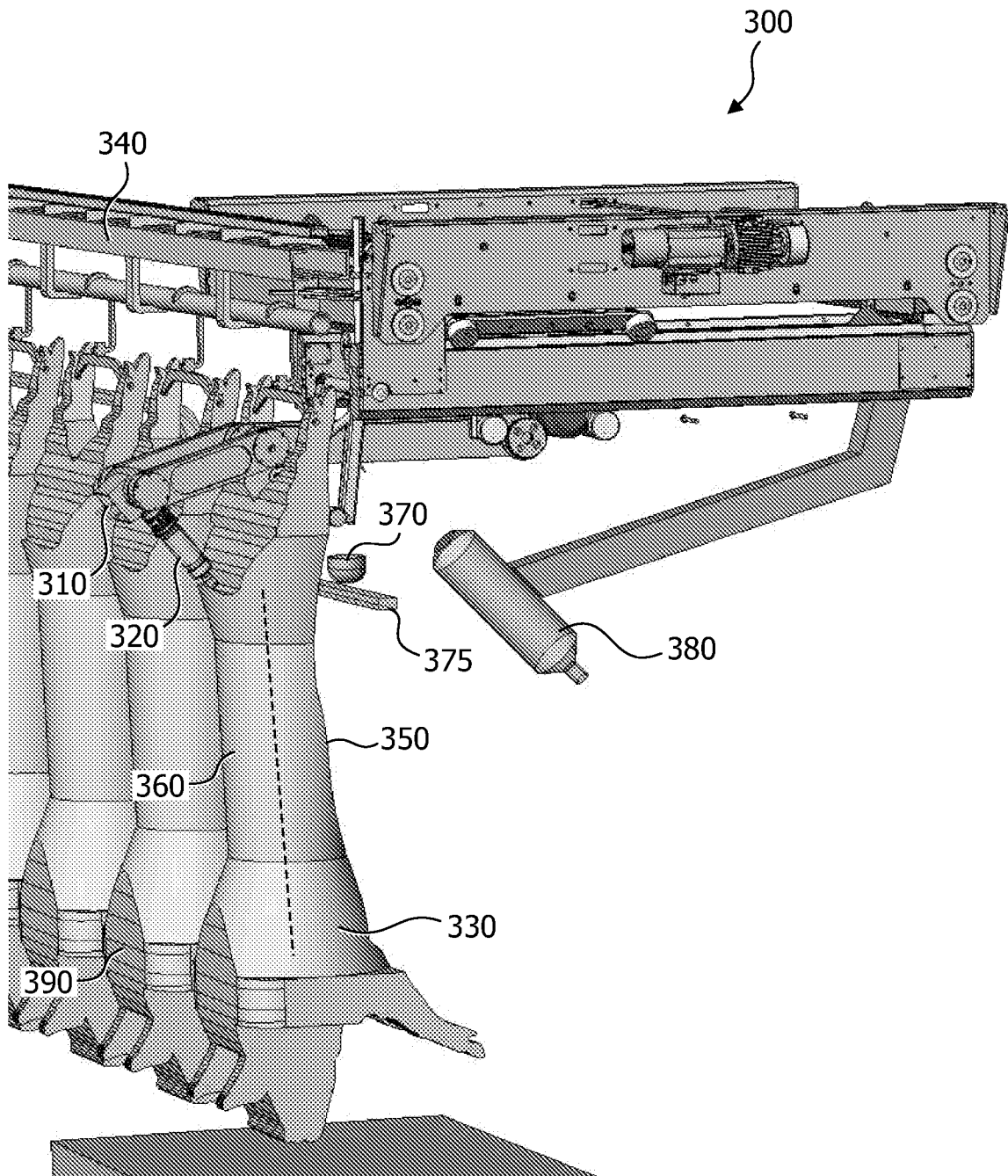


FIG. 3B

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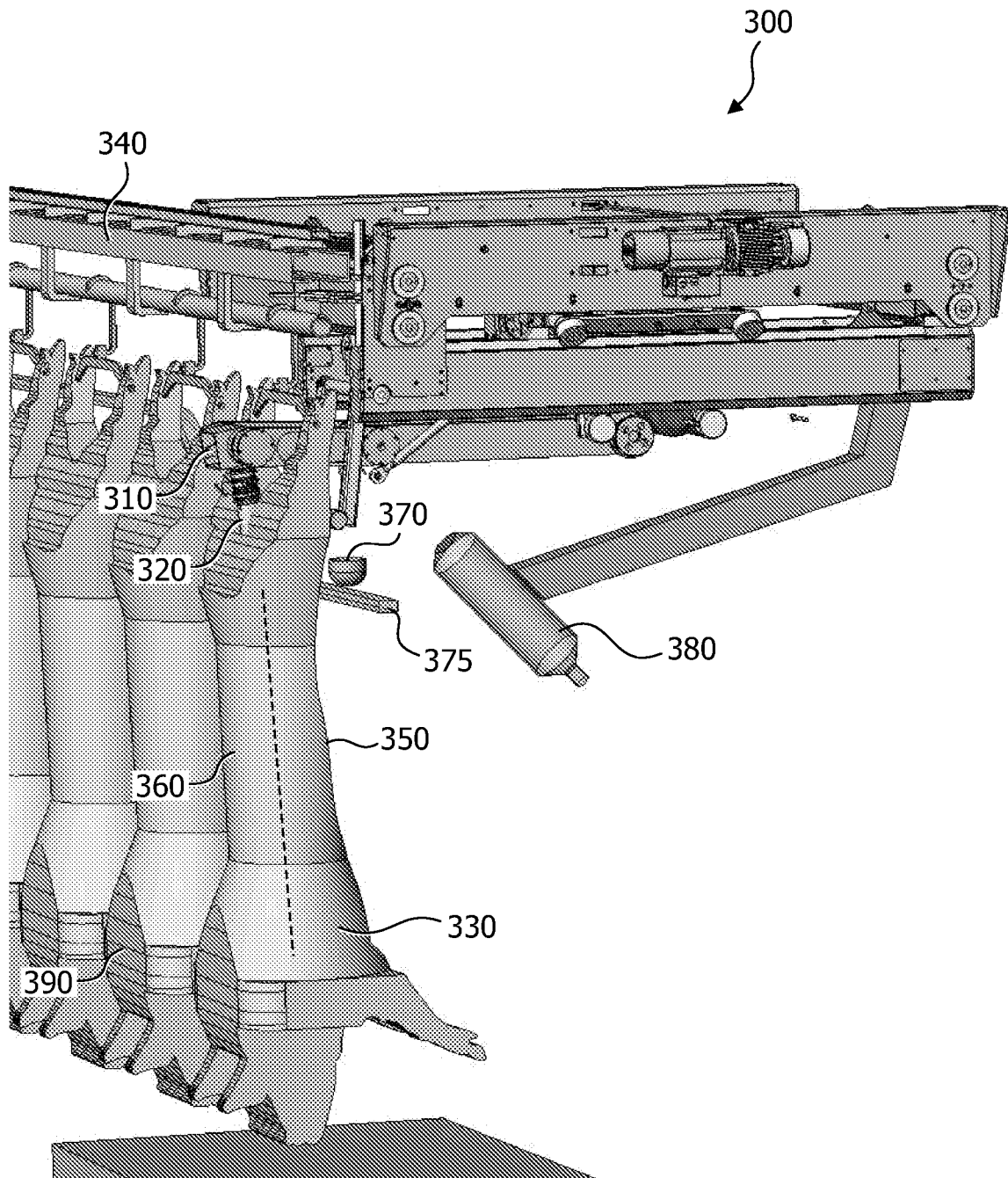


FIG. 3C

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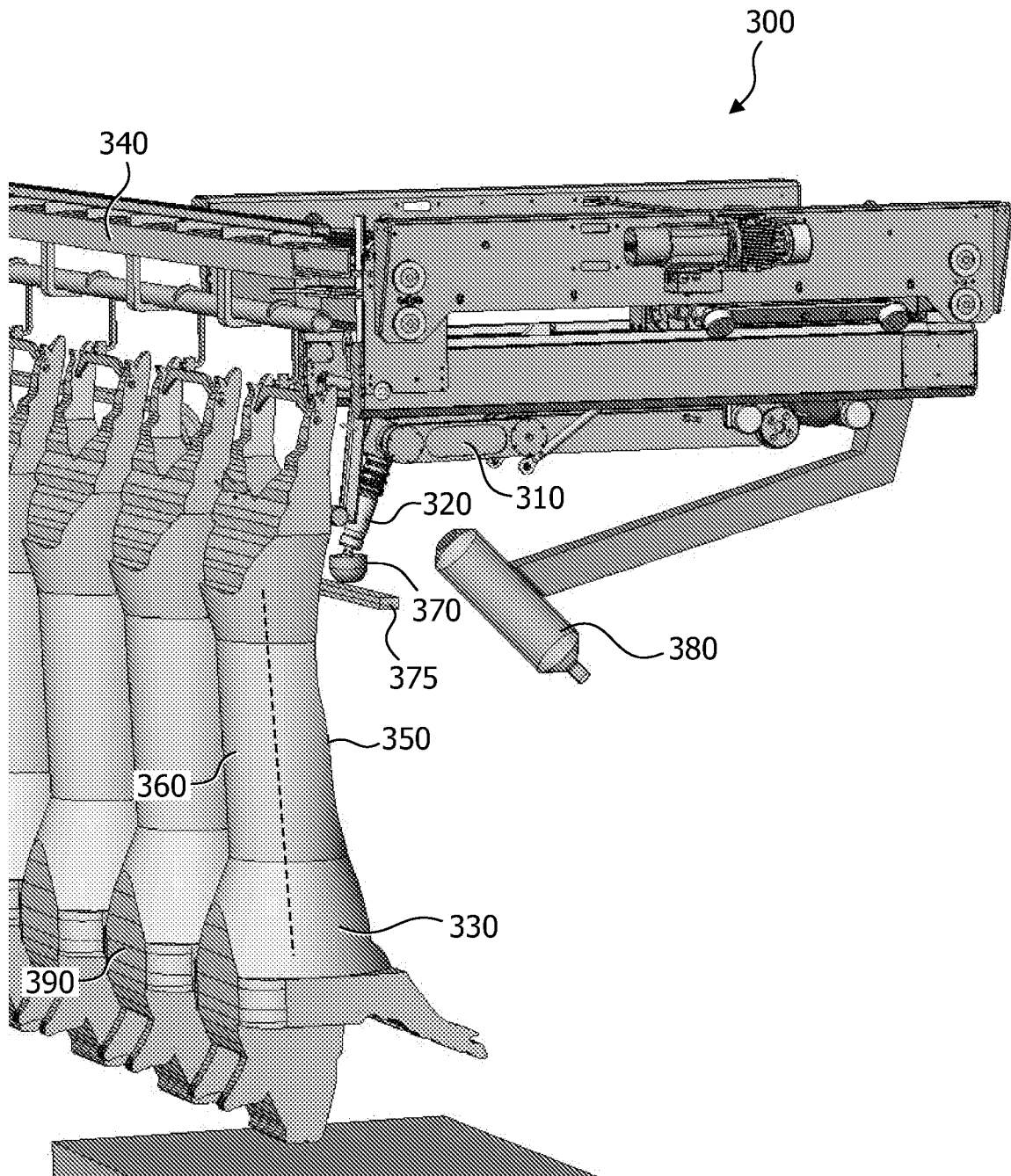


FIG. 3D

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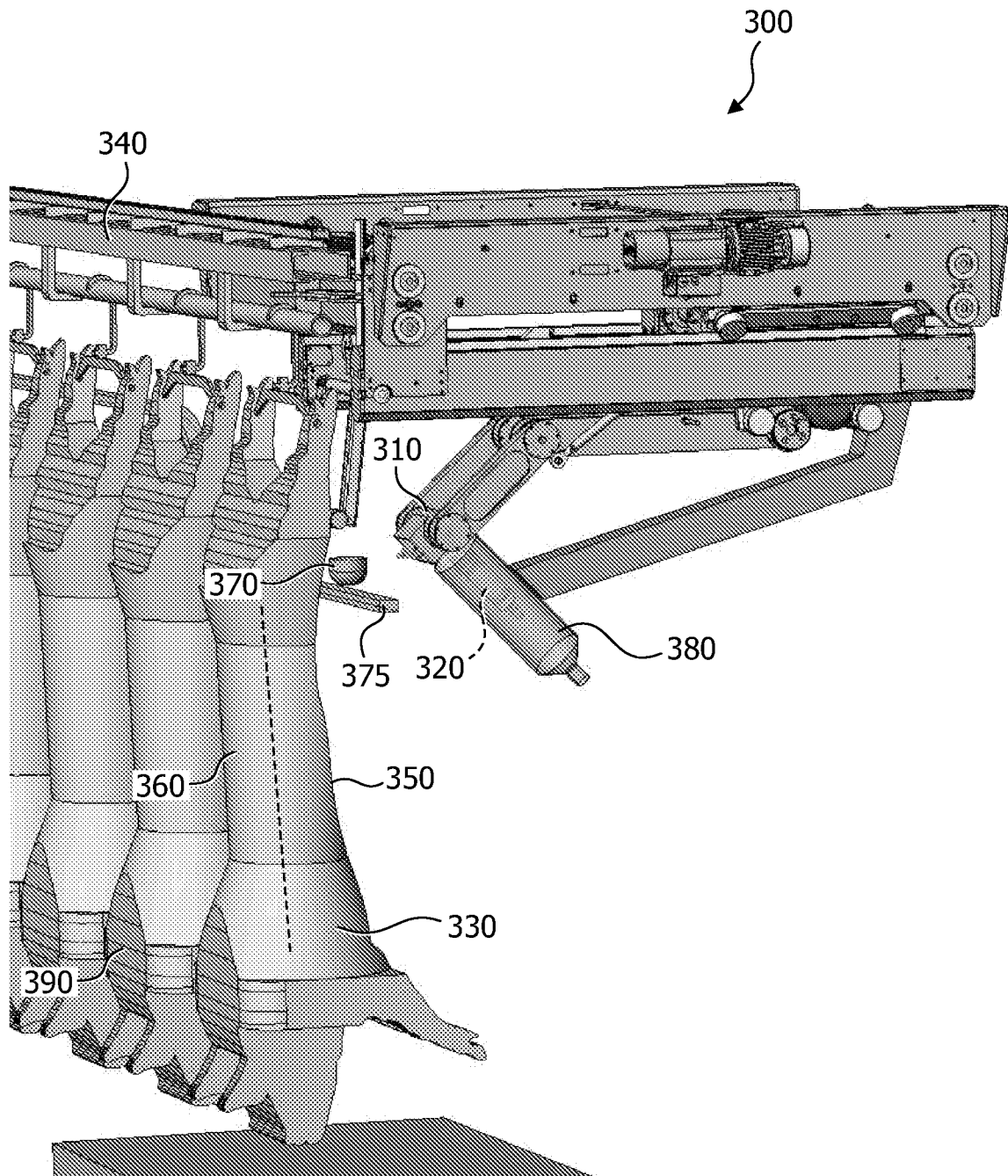


FIG. 3E