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(54) Benævnelse: **INDRETNING, ARBEJDSSTATION OG FREMGANGSMÅDE TIL AT SKÆRE HOVEDET AF ET DYRS SLAGTEKROP**

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US-A- 1 081 851

DESCRIPTION

Description

[0001] The present invention relates to a cutting device for cutting the head off a slaughtered animal's carcass comprising: two knives, both provided with a cutting edge; and controls for moving the knives towards and away from each other such that the cutting edges of the knives cooperate in a cutting action. The present invention also relates to an automatic work station for cutting the head off a slaughtered animal's carcass provided with such a cutting device, as well as to a method for cutting the head off a slaughtered animal's carcass.

[0002] The prior art cutting devices for mechanical cutting the head off a slaughtered animal's carcass comprise separating devices with driven scissor knives. Such mechanical driven scissors can be manipulated manually or via a mechanical manipulator. An example of such a mechanical manipulator for a pair of separating knives is for instance known from EP 0 212 580. The mechanical positioning of the separating knives in this manipulator can be dependent from a length measurement of the carcass to be cut.

[0003] United States patent US 1,081,851 describes a fowl-decapitator comprising a pair of levers which are pivotally connected. The outer ends of the levers are formed with cooperating bevelled cutting edges, wherein the inner portion of a first cutting edge is concave in form and wherein the inner portion of the second cutting edge is concave in form, so that in operating the fowl-decapitator the neck of the fowl, after being positioned between both cutting edges will be securely imprisoned between both edges.

[0004] Furthermore, European patent application EP 0 635 210 A1 describes a separating device, for instance a hydraulically or pneumatically energized pair of scissors, to arrange a separation in the cervical vertebral column, for instance between the skull and the first cervical vertebra.

[0005] The problem to be solved is that the position of separation of a head of a slaughtered animal's carcass is not well controlled.

[0006] As a solution the present invention provides a cutting device for cutting the head off a slaughtered animal's carcass according claim 1. The protruding cutting edge portion is located more or less centrally at at least one of the knives as on both sides of the protruding cutting edge portion set back cutting edge portions are provided. As the cutting action starts the protruding cutting edge portion of at least one of the knives will first come in contact with the (neck of) the slaughtered animal's carcass and will this also enter the carcass first. In case the protruding cutting edge portion enters the neck of the slaughtered animal's carcass close to the head the protruding cutting edge portion will make contact with the slaughtered animal's

cranium posterior side (crown of the skull). The cranium posterior side that is contacted by the protruding cutting edge portion(s) is defined by the posterior surface of the occipital bone. As the posterior surface of the occipital bone has two slanting (sloping) more or less flat surfaces which lead from the dual sides of the head (skull) upward (that is to say away from the front side of the head) to a location where the two more or less flat surfaces meet at a rounded off ridge. Due to the shape of the cranium posterior side the protruding cutting edge portion(s) are guided along the cranium posterior side (crown of the skull). Due to such guided movement of the protruding cutting edge portion(s) the (whole) knives will be guided during their cutting movement as well as the protruding cutting edge portion(s) is connected to at least one of the knives. As far as one of the knives is not provided with a protruding cutting edge portion such knife will be "dragged along" as for the guiding along the cranium posterior side by another knife that is provided with a protruding cutting edge portion due to the coupling of the knives as the knives have to cooperate in their cutting action. As for the positioning of the neck of the carcass between the knives and for optimising the cutting action the knives have substantially concave curved cutting edges.

[0007] One of the advantages of guiding the knives along the cranium posterior side is that the knives will cut the neck very close to the head. As the knives are guided by the protruding cutting edge portion(s) along the posterior surface of the occipital bone a closer positioning of the knives during their cutting operation is hardly impossible. This results thus in a separation of the animal's trunk and the head wherein the yield is maximised due to the effect that more meat of the neck remains at the trunk (body) of the carcass than with the prior art separation techniques. A further advantage is that due to the guiding of the knives along the cranium posterior side the knives are prevented from cutting into the cranium posterior side, which implies that there are no (or only minimal) bone fragments in the cut apart trunk and head. It will be clear that minimal presence of bone fragments enhances the quality of the separated carcass parts.

[0008] The controls for moving the knives towards and away from each other to provide the required cutting action may comprise a drive system and an intelligent steering system, e.g. an automated steering system provided with one or more sensors for allocating the carcasses and/or allocating specific anatomical characteristics of the carcasses to be processed. Furthermore the knives may be at least two knives which at least two knives may cooperate by passing along each other, e.g. as an upper knife and a lower knife. However also manual use of the cutting device according the present invention is also an option, especially in those conditions where few carcasses have to be processed, labour is relative cheap and/or carcasses with substantial variation in dimensions have to be processed.

[0009] In the situation that two knives are provided with a position-finding protruding cutting edge portion both of the knives may be guided by the cranium posterior side and thus the chances of undesired slanting of the cooperating knives with a risk of cutting into bone is further limited.

[0010] In a specific embodiment of the cutting device according the present invention the two

knives are forming a pair of shears and the controls are comprising a rotational drive. Such a knife assembly is known as a pair of scissors and enables an easy handling and positioning of the knives as the knives are combined via a mutual shaft (axle). However in an alternative embodiment the two knives may be linear displaceable towards and away from each other and the controls may comprise a linear drive. Such linear displaceable knives may for instance run in linear guides and may be powered by one or more cylinders (pneumatic or hydraulically driven). As an even further embodiment and as an alternative for rotational (scissor) knives and linear displaceable knives also other drive construction may be selected like for instance a drive with a linkage system providing a more complex mutual movement of the knives.

[0011] For easy access of the neck of the carcass between the knives before the separation starts the knives may comprise a free side enabling the positioning of the neck of a carcass between moved apart knives. In a further embodiment two cooperating knives may each have a free side enabling the easy access for the neck of a slaughtered animal's carcass to be cut.

[0012] Yet another embodiment of the cutting device according the present invention is provided with three cooperating knives, of which three knives two may be positioned on opposite sides of the neck to be separated and a third knife to be moved along the two other knives so to provide the required neck cutting.

[0013] The position-finding protruding cutting edge portion may be integrated with the two-sided adjoining set back cutting edge portions. Such knife construction is relatively easy to manufacture and is easy in use providing minimal demand for maintenance and repair. As an alternative it is also possible to provide a position-finding protruding cutting edge portion that is moveably connected with the two-sided adjoining set back cutting edge portions. Such moveable position-finding protruding cutting edge portion has the advantage of enabling to also use the knife without the guiding action of the position-finding protruding cutting edge portion and/or the position-finding protruding cutting edge portion can be exchanged separated from the knife separation, e.g. when the position-finding protruding cutting edge portion is more sensitive for wear and/or when a specific hatch of carcasses to be processed has specific dimensions.

[0014] In a further embodiment of the cutting device according the present invention the cutting edge of the position-finding protruding cutting edge portion may be chamfered. Not only is it easier for a chamfered (bevelled) protruding knife part to enter the carcass (to penetrate the skin and tissue) but it also enables an easier sliding of the position-finding protruding cutting edge portion along the bone of the cranium posterior side. In this respect especially the knife that is located closest to the cranium posterior side is chamfered with the bevelled side direct towards the cranium posterior side.

[0015] The invention also provides an automatic work station for cutting the head off a slaughtered animal's carcass comprising: a cutting device according the invention and as disclosed above; and a manipulator for positioning the cutting device relative to the slaughtered animal's carcass to be cut, wherein the cutting device is held by the manipulator

such that it has the freedom to move towards an ideal position dependant on the forces exerted by the carcass on the position-finding protruding cutting edge portion of at least one of the knives. Such a work station enables automatic use of the knifes.

[0016] The work station may also be provided with cleaning means for cleaning the knives between subsequent cutting operations. The position-finding protruding cutting edge portion can be dimensioned such that it is not hindering the (automatic) cleaning of a knife provided with a protruding portion. The work station may also be multiple
constructed so that it comprises at least two cutting devices according the present invention. Plural cutting devices enable cleaning outside the critical path of the processing, makes the work station less sensible for breakdown and/or enables maintenance and repair during processing.

[0017] The present invention also provides a method for cutting the head off a slaughtered animal's carcass comprising the processing steps: A) positioning the knives of a cutting device according the present invention on opposite sides of the neck of a carcass where the head is to be cut; B) moving the knives towards each other close to the back of the slaughtered animal's head such that the position-finding protruding cutting edge portion enters the neck and scrapes over the posterior surface of the occipital bone whereby the knives of the cutting devices are moved towards the head of the carcass where the head is to be cut; and C) further moving the knives towards each other so that the head is at least partially cut off. This method provides the advantages as already mentioned above in relation to the cutting device according the present invention and are here incorporated by reference. During the processing steps A) - C) the slaughtered animal's carcass may be hanging on the hind legs enabling easy access to the neck. To limit the danger of cross contamination the knives are cleaned in between the cutting of two subsequent carcasses, and as mentioned before such cleaning off the knives may take place while another pair of knives is cutting a carcass.

[0018] The present invention will be further elucidated on the basis of the non-limitative exemplary embodiments shown in the following figures. Herein:

figure 1 a schematic view on an automatic work station for cutting the head off a slaughtered animal's carcass according the present invention;

figure 2 a view on a pig skull before separating the head from the trunk of the animal's carcass wherein also the skull is depicted;

figure 3 a perspective view on a device for cutting the head off a slaughtered animal's carcass;

figure 4 a perspective view on an alternative (double) embodiment of the device for cutting the head off a slaughtered animal's carcass according the present invention;

figure 5 a perspective view on a second alternative embodiment of the device for cutting the head off a slaughtered animal's carcass according the present invention.

[0019] Figure 1 shows an automatic work station 1 for cutting the head 2 of a slaughtered animal's carcass 3 that is hanging on his hind legs 4 to an overhead transport system 5. A robot arm 6 carries two sets of knives 7,8 and 9,10. One set knives 7,8 is directed towards the slaughtered animal's carcass 3 and is to be positioned behind the head 2 of the slaughtered animal's carcass 3 to separate the head 2 from the trunk 11 of the animal's carcass 3. For positioning the set knives 7,8 the work station 1 is provided with a sensor 12 (vision system) which feeds information to an intelligent processing unit 13, which intelligent processing unit 13 is controlling the robot arm 6.

[0020] In figure 2 the head 20 of a pig is depicted including a skull 21 that is embedded in the head 20. In relation to the present invention especially the posterior surface 22 of the occipital bone 23 is of importance as will be clarified later. The posterior surface 22 of the occipital bone 23 has two slanting (sloping) more or less flat surfaces 24 of which only one is visible in this figure. The two slanting more or less flat surfaces 24 meet at a ridge 25. The shape of the two slanting more or less flat surfaces 24 of the posterior surface 22 of the occipital bone 23 (the crown of the skull) is used in guiding the knives to the location of cutting off the head 2.

[0021] Figure 3 shows a device 30 for cutting the head off a slaughtered animal's carcass provided with two rotational connected knives 31, 32. The knives 31, 32 are both provided with a cutting edge 33, 34 as well as that both knives 31, 32 are both provided with a position-finding protruding cutting edge portion 35, 36, These position-finding protruding cutting edge portions 35, 36 both have a forward cutting edge that protrudes compared to two-sided adjoining set back cutting edge portions 37, 38; 39, 40. The knives 31, 32 can be moved towards and away from each other to cut the head 2 of a slaughtered animal's carcass 3 (see figure 1). During the initial phase of the cutting the position-finding protruding cutting edge portions 35, 36 will scrape over the posterior surface 22 of the occipital bone 23 (see figure 2) whereby the position of the knives 31, 32 in respect of the skull 21 (see figure 2) is determined by the contact of the position-finding protruding cutting edge portions 35, 36 with the posterior surface 22 of the occipital bone 23. The knives 31, 32 will during cutting move towards each other (here by rotating the knives 31, 32) during which approaching the knives 31, 32 are thus moving close to the posterior surface 22 of the occipital bone 23 without cutting bone parts from the skull 21.

[0022] Figure 4 shows an alternative embodiment of a cutting device 50 according the present invention for cutting the head off a slaughtered animal's carcass. The knives 51, 52 have a two-sided design which enables to use one side of the knives 51, 52 while the other side can for instance be cleaned. It is also possible to modify the two sides of the knives 51, 52, e.g. for processing (cutting) slaughtered animals' carcasses with different dimensions.

[0023] Figure 5 shows a further alternative embodiment of a cutting device 60 according the present invention for cutting the head off a slaughtered animal's carcass. The cutting device 60 is provided with two knives 61, 62 only one of the two 61 provided with a position-finding protruding cutting edge portion 63, which position-finding protruding cutting edge portion 63

has a forward cutting edge 64 that protrudes compared to two-sided adjoining set back cutting edge portions 65, 66 of the knife 61. The knives are linear moveable in a guide 67 by an actuation cylinder 68 so that during cutting they partially move along each other.

[0024] The technical features as disclosed in the various embodiments of the figures 1 - 5 are not only disclosed in relation to the embodiment as depicted but also in combination with technical features selected form one or more of the other embodiments.

REFERENCES CITED IN THE DESCRIPTION

Cited references

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Patent documents cited in the description

- EP0212580A **[0002]**
- US1081851A **[0003]**
- EP0635210A1 **[0004]**

Patentkrav

1. Skæreindretning (30, 50, 60) til at skære hovedet (2, 20) af et dyrs slagtekrop (3), hvilken indretning omfatter:
- mindst to knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62), der begge er forsynet med en skærekant (33, 34), og
- styringselementer til at flytte knivene (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) mod og væk fra hinanden, således at knivenes (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) skærekanter (33, 34) arbejder sammen i en skærehandling, hvor mindst én af knivene (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) er forsynet med en positionslokaliserende udragende skærekantdel (35, 36, 63), hvilken positionslokaliserende udragende skærekantdel (35, 36, 63) har en forreste skærekant (64), der rager frem i forhold til 15 tosidede tilstødende tilbagesatte skærekantdele (37, 38, 39, 40, 65, 66),
kendetegnet ved, at de mindst to knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) har i det væsentlige konkave buede skærekanter (33, 34), hvor den positionslokaliserende udragende skærekantdel (35, 36, 63) har den funktion, at den positionslokaliserende udragende skærekantdel (35, 36, 63), når de mindst to knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) flyttes mod hinanden tæt på bagsiden af det slagtede dyrs hoved (2, 20), føres langs den bageste side af kraniet på dyrets slagtekrop (3).

2. Skæreindretning (30, 50, 60) ifølge krav 1, kendetegnet ved, at to knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) er forsynet med den positionslokaliserende udragende skærekantdel (35, 36, 63).

3. Skæreindretning (30, 50, 60) ifølge krav 1 eller 2, kendetegnet ved, at de to knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) danner et saksepar, og styreelementerne omfatter et rotationsdrev.

4. Skæreindretning (30, 50, 60) ifølge krav 1 eller 2, kendetegnet ved, at de to knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) er lineært forskydelige mod og væk fra hinanden, og

styreelementerne består af et lineært drev.

5. Skæreindretning (30, 50, 60) ifølge et af de foregående krav, kendetegnet ved, at skæreindretningen omfatter tre samarbejdende knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62).

6. Skæreindretning (30, 50, 60) ifølge et af de foregående krav, kendetegnet ved, at den positionslokaliserende udragende skærekantdel (35, 36, 63) er bevægeligt forbundet med de tosidede tilstødende tilbagesatte skærekantdele (37, 38, 39, 40, 65, 66).

7. Skæreindretning (30, 50, 60) ifølge et af de foregående krav, kendetegnet ved, at de to knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) fortsætter på den modsatte side af de frie sider til to yderligere samarbejdende knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62), hvoraf mindst én af de yderligere knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) også er forsynet med en udragende positionslokaliserende skærekantdel (35, 36, 63).

8. Automatisk arbejdsstation (1) til at skære hovedet (2, 20) af et dyrs slagtekrop (3), hvilken station omfatter:
- en skæreindretning (30, 50, 60) ifølge et af de foregående krav, og
- en manipulator til at positionere skæreindretningen (30, 50, 60) i forhold til dyrets slagtekrop (3), der skal skæres,
hvor skæreindretningen (30, 50, 60) holdes af manipulatoren således, at den har frihed til at bevæge sig mod en ideel position afhængigt af de kræfter, der udøves af slagtekroppen (3) på den positionslokaliserende udragende skærekantdel (35, 36, 63) af mindst én af knivene (7, 8, 9, 10, 31, 32, 51, 52, 61, 62).

9. Automatisk arbejdsstation (1) til at skære hovedet (2, 20) af et dyrs slagtekrop (3) ifølge krav 8, kendetegnet ved, at arbejdsstationen (1) også er forsynet med renseelementer til at rense knivene (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) mellem på hinanden følgende skæreoperationer.

10. Automatisk arbejdsstation (1) til at skære hovedet (2, 20) af et dyrs slagtekrop (3) ifølge krav 8 eller 9, kendetegnet ved, at arbejdsstationen (1) omfatter mindst to skæreindretninger (30, 50, 60) ifølge et af kravene 1-7.

11. Fremgangsmåde til at skære hovedet (2, 20) af et dyrs slagtekrop (3), hvilken fremgangsmåde omfatter følgende forarbejdningstrin:
A) positionering af knivene (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) af en skæreindretning (30, 50, 60) ifølge et hvilket som helst af kravene 1-7 på modsatte sider af halsen på en slagtekrop (3), hvor hovedet (2, 20) skal skæres
B) flytning af knivene (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) mod hinanden tæt på bagsiden af det slagtede dyrs hoved (2, 20) således, at den positionslokaliserende udragende skærekantdel (35, 36, 63) kommer ind i halsen og skraber over den bageste overflade (22) af nakkebenet (23), hvorved skæreindretningernes (30, 50, 60) knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) flyttes mod slagtekroppens (3) hoved (2, 20), hvor hovedet (2, 20) skal skæres, og
C) yderligere flytning af knivene (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) mod hinanden, således at hovedet (2, 20) i det mindste delvist skæres af.

12. Fremgangsmåde til at skære hovedet (2, 20) af et dyrs slagtekrop (3) ifølge krav 11, kendetegnet ved, at dyrets slagtekrop (3) hænger på bagbenene (4) under forarbejdningstrinnene A) - C).

13. Fremgangsmåde til at skære hovedet (2, 20) af et dyrs slagtekrop (3) ifølge krav 11 eller 12, kendetegnet ved, at knivene (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) renses mellem opskæringen af to på hinanden følgende slagtekroppe.

14. Fremgangsmåde til at skære hovedet (2, 20) af et dyrs slagtekrop (3) ifølge krav 11 eller 12, kendetegnet ved, at et par knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) renses, mens et

andet par knive (7, 8, 9, 10, 31, 32, 51, 52, 61, 62) skærer en slagtekrop (3).

DRAWINGS

Drawing

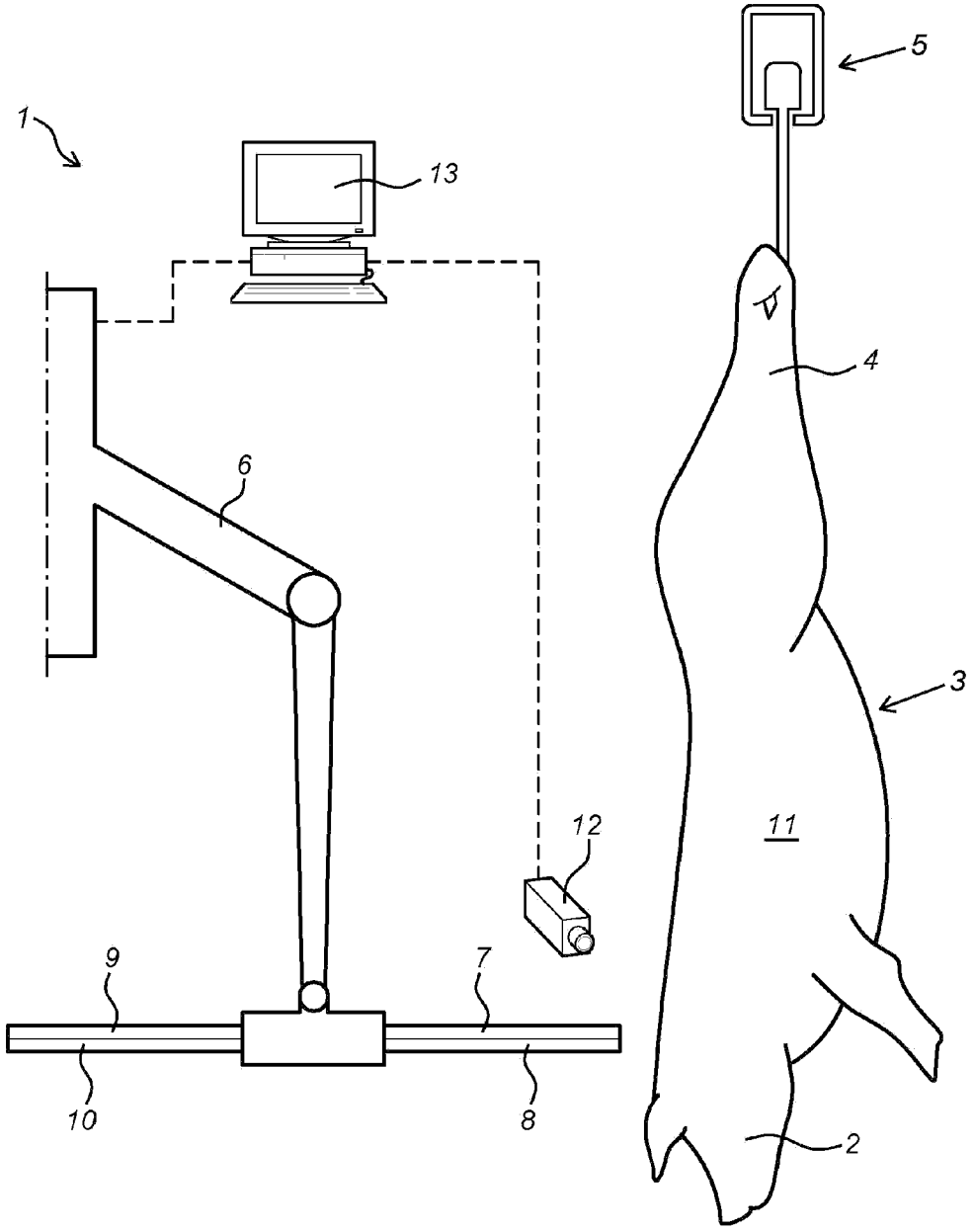

Fig. 1

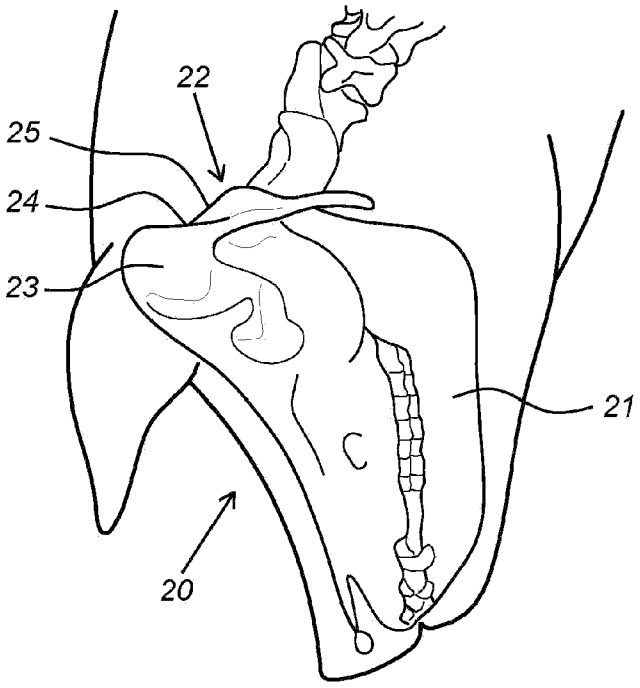

Fig. 2

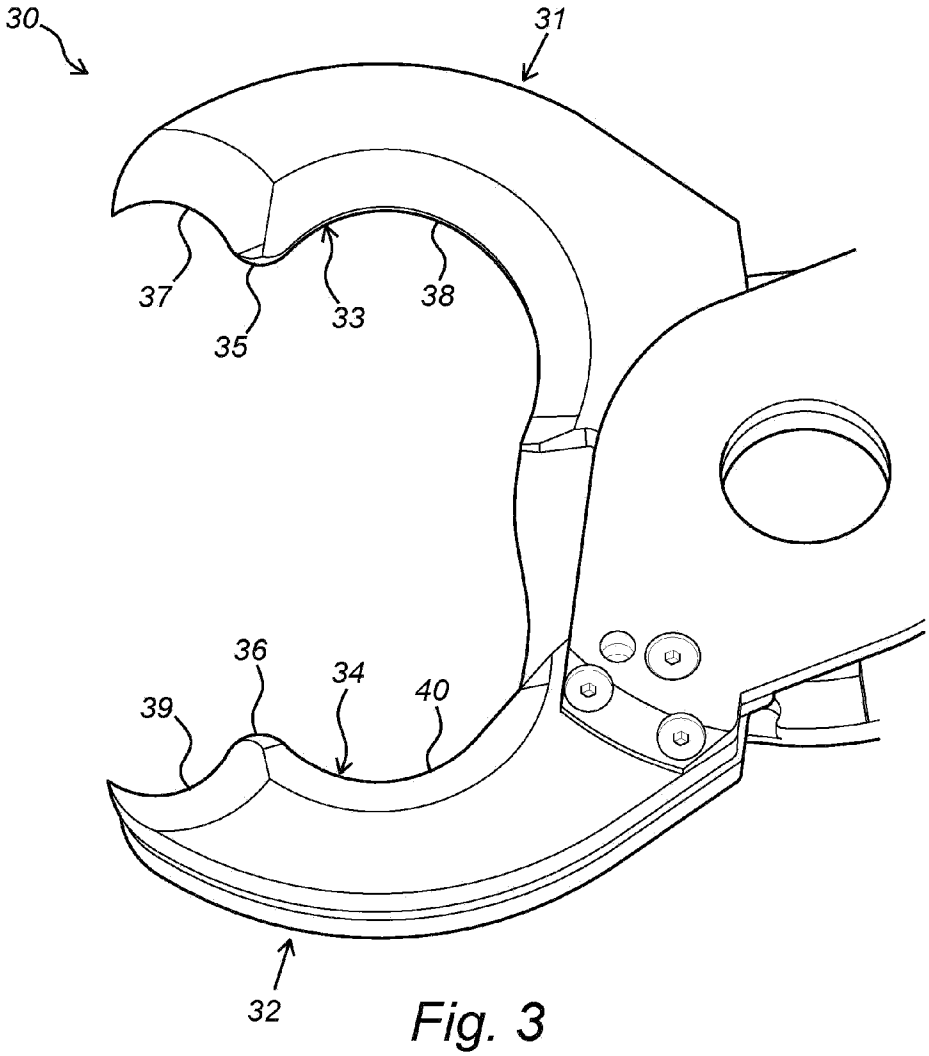

Fig. 3

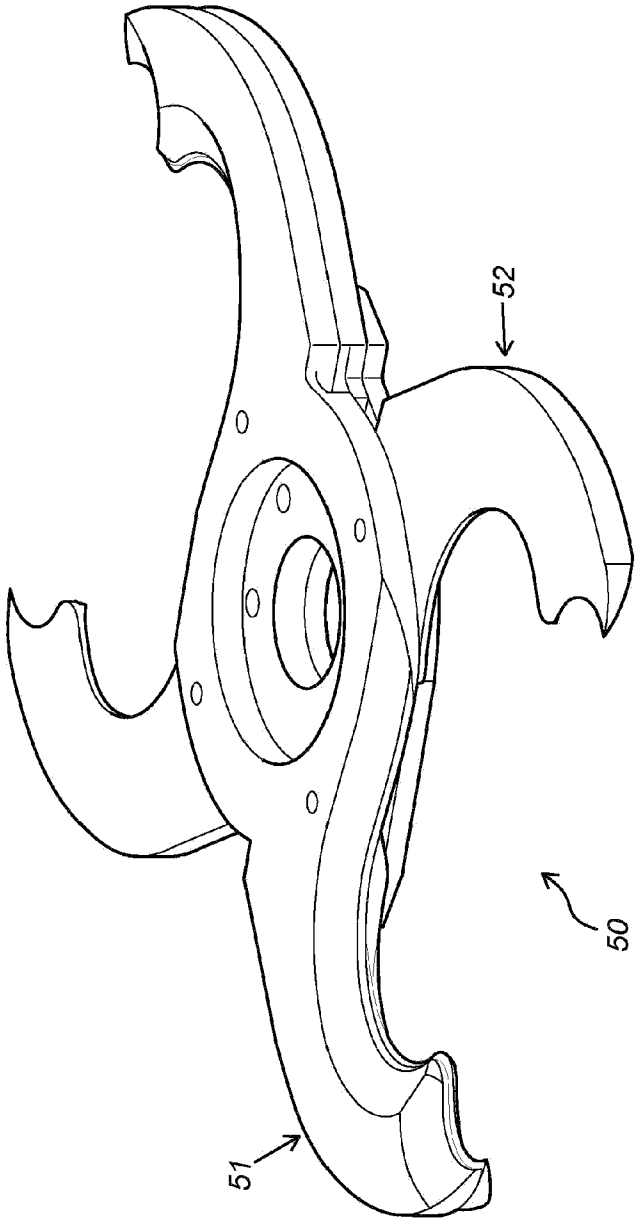

Fig. 4

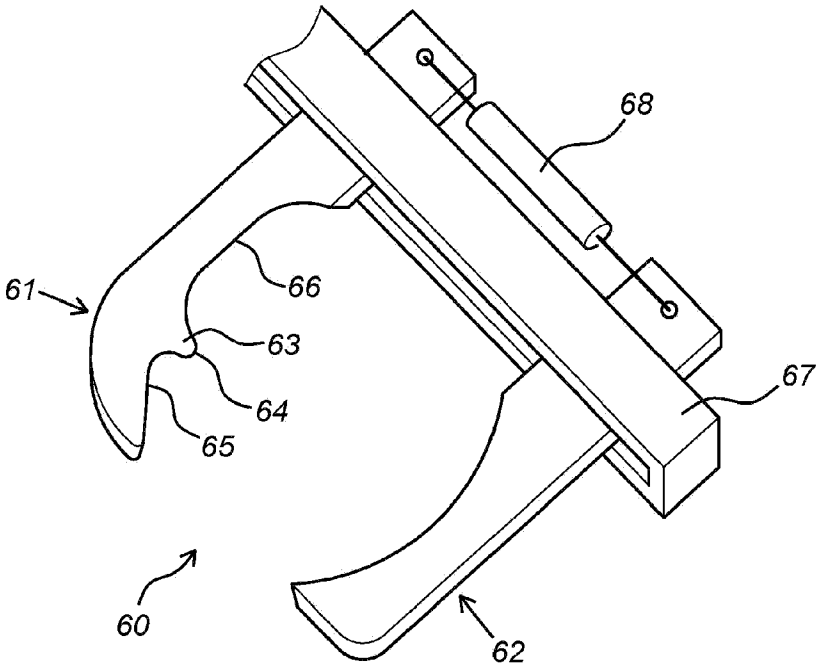

Fig. 5