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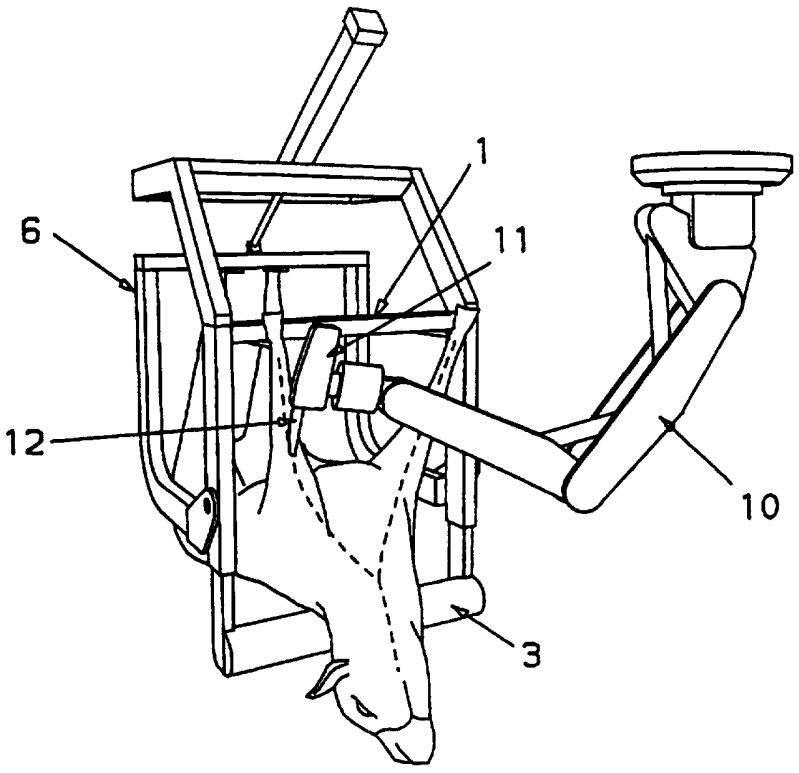
Published
With international search report.

(54) Title: ANIMAL CARCASS SUPPORT FRAME AND DRESSING METHOD

(57) Abstract

An animal carcass support frame for holding and positioning an animal carcass during operations thereon suspends the carcass in an inverted position from the front and rear hocks of the carcass. The frame comprises means to raise and/or lower the front and rear parts of the carcass. A dressing system is described comprising the frame and an industrial robot comprising a robotic arm equipped with a cutting tool for dressing the carcass and programmed to carry out dressing operations on the carcass. Also disclosed is a cutting tool for equipping to a robotic arm of an industrial robot, to be manipulated by the robot.



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ANIMAL CARCASS SUPPORT FRAME AND DRESSING METHOD

FIELD OF INVENTION

The invention comprises an animal carcass support frame and dressing method.

BACKGROUND ART

Currently in a meat works animal carcasses are dressed manually by meat workers, which is labour intensive. Further mechanisation of the dressing process is inhibited by the fact that no one animal carcass is identical in size and shape to another, and moreover in a conventional meat works chain carcasses are suspended from above in a way that allows for a relatively large amount of movement of the carcass so that a particular point on each carcass proceeding along the chain, such as the point at which the Y-cut is begun, will never be in the same position from one carcass to the next.

SUMMARY OF INVENTION

The present invention provides a frame which supports a carcass and which presents it in a uniform way. The frame of the invention may be used to present a carcass uniformly to different machines along a processing chain or in different ways to a stationary dressing machine, such as a robotic arm equipped with various tools for example. The frame may hold the carcass to present it to each set of tools at a processing station so that a number of operations can be carried out at the same station. The frame of the invention allows for the orientation

or position of the carcass to be determined or maintained or altered with respect to the frame and hence with respect to other devices or objects.

The invention also provides a carcass dressing method using an industrial robot.

In broad terms in one aspect of the invention comprises an animal carcass support frame for holding and positioning an animal carcass during operations thereon, comprising

a front frame part comprising means to suspend the carcass in an inverted position from the front hocks of the carcass and a neck support part to support the inverted carcass below the neck or shoulders,

a rear frame part comprising means to suspend the rear hocks of the carcass, and

means to move the rear and/or front frame parts relative to one another to raise and/or lower the rear part of the carcass relative to the front part of the carcass or the front part of the carcass relative to the rear part of the carcass.

Preferably the rear frame part is pivotally mounted to the front frame part along a substantially horizontal axis for

pivotal movement to raise and lower the rear frame part relative to the front frame part.

In broad terms in another aspect the invention comprises an animal carcass support frame as described together with an industrial robot comprising a robotic arm equipped with a cutting tool for dressing the carcass and programmed to carry out dressing operations on the carcass.

Preferably the robot is programmed to carry out at least the front Y-cut down the front legs and chest of the carcass.

The invention also comprises a cutting tool for equipping to a robotic arm of an industrial robot, the cutting tool being manipulatable and operable under control of the industrial robot, comprising two parallel adjacent cutting blades reciprocally movable in the same plane each beside the other and a motor which drives the cutting blades, the cutting blades and motor being formed as a unit attachable to the robot arm, and means to attach the cutting tool to the robot arm.

In broad terms in a further aspect the invention comprises a method of dressing a carcass comprising suspending the carcass in an inverted position from the front and rear hocks of the carcass, and carrying out dressing operations on the

carcass by an industrial robot comprising a robotic arm equipped with a cutting tool for dressing the carcass.

DESCRIPTION OF DRAWINGS

The invention will be further described with reference to the accompanying drawings by way of an example, wherein:

Fig. 1 is a perspective view of a preferred form of frame of the invention,

Figs 2A and 2B show the preferred form frame of Fig. 1 in a forward position,

Figs 3A and 3B show the preferred form frame in an intermediate position,

Figs 4A and 4B show the preferred form frame in a rear position,

Fig. 5 shows a robotic arm of an industrial robot making a front Y-cut on a carcass suspended in inverted position, and

Fig. 6 shows a preferred form cutting tool of the invention for manipulation by an industrial robot.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to Figs 1 to 4, the frame includes a front part which comprises a top transverse member 1 to which the carcass's front hocks are held by suitable clamps or spikes for exam e, or other means for holding the front hocks of the carcass. There are two downwardly extending members 2a and 2b on either side and a lower transverse member 3 which forms a neck support part of the frame to support a carcass behind the neck or shoulders. The neck support member 3 is carried by vertical members 4a and 4b telescopically mounted in the members 2a and 2b and controlled by hydraulic rams or similar to raise and lower the neck support part 3.

A rear frame part comprises a top transverse member 5 to which the carcass's rear hocks are held, again by suitable clamps or spikes or similar, which is pivotally connected to the front frame part at pivot points 7. Movement of the rear frame part is controlled by the hydraulic or pneumatic ram 8.

In use of the frame to support a carcass during dressing operations on the carcass, the front hocks of a carcass are first attached to the top transverse member 1 and the rear hocks of a carcass are attached to the top transverse member 5. The frame is then used to position the carcass as desired. For example, the rear frame part may be elevated by the ram 8 to the position shown in Figs 2A and 2B to aid the draining of blood from the neck cut and sticking. The rear frame part may then be

dropped to the position shown in Fig. 3A and 3B so that the stomach contents do not drain out of the oesophagus. After the oesophagus is clipped, the rear frame part may be raised to the intermediate position shown in Figs. 4A and 4B so that the carcass brisket region is horizontal. At this stage the front Y-cut may be carried out (see Fig. 5), the brisket flaps pulled back and the neck, shoulders and forelegs cleared. In this position further operations may be carried out including hock removal, belly operations, rear Y cutting and splitting of the brisket flap.

Fig. 5 shows the preferred form frame together with an industrial robot comprising a robotic arm 10. The robotic arm is shown as a roof or ceiling mounted robotic arm or the arm 10 may be mounted from a beam above, but the robot may be of any suitable type such as a robot which stands on the floor, comprising two or more robot arms for example. The robot is used to make the dressing cuts in the carcass. The frame of the invention positions each carcass in a substantially identical position when compared to conventional means of suspending a carcass from a moving processing chain for example. Thus the point at which the robot starts a cut such as the front Y-cut shown in Fig. 5, is always in a similar spatial position. Fig. 5 shows the robotic arm 10 mounting a cutting tool 11 on the end thereof comprising cutting blades 12 making the front Y-cut down the front legs and chest of the carcass. The robot may be

programmed to make other dressing cuts and Fig. 5 shows the robot arm making the front Y-cut by way of example.

ig. 6 shows a preferred form cutting tool. The tool comprises two parallel adjacent cutting blades 13 and a motor within the cutting tool body unit 14 which drives the cutting blades 13. The motor may be connected to the cutting blades through a gearbox within the cutting tool body unit 14. The motor is controlled by the robot. When the motor is operated, the cutting blades 13 reciprocate back and forth together in a cutting action. In the preferred form the cutting blades move with a rotary reciprocal action as indicated by the arrows in Fig. 6. This has been found most effective for cutting through the pelt of an animal carcass.

It is also preferred that the cutting blades 13 are cranked as shown, comprising a first cutting edge portion 13a and a second cutting edge portion 13b which has shark tooth shaped teeth. The shark tooth teeth point back towards the first blade portion 13a as shown.

In use the robot having the cutting tool of Fig. 6 mounted to the end of the robotic arm inserts the cutting tool through an initial puncture made through the pelt of the carcass. The robot then energises the motor to cause the cutting blades 13 to operate, and the robot arm moves the cutting tool upwardly to make for example the front Y-cut as shown in Fig. 5.

In the preferred form cutting tool the motor is an air motor but it could alternatively be an electric or hydraulic motor for example.

The foregoing describes the invention including a preferred form thereof. Alterations and modifications as will be obvious to those skilled in the art are intended to be incorporated in the scope hereof as defined in the following claims.

CLAIMS

1. An animal carcass support frame for holding and positioning an animal carcass during operations thereon, comprising

a front frame part comprising means to suspend the carcass in an inverted position from the front hocks of the carcass and a neck support part to support the inverted carcass below the neck or shoulders,

a rear frame part comprising means to suspend the rear hocks of the carcass, and

means to move the rear and/or front frame parts relative to one another to raise and/or lower the rear part of the carcass relative to the front part of the carcass or the front part of the carcass relative to the rear part of the carcass.

2. An animal carcass support frame as claimed in claim 1, wherein the rear frame part is pivotally mounted to the front frame part along a substantially horizontal axis for pivotal movement to raise and lower the rear frame part relative to the front frame part.

3. An animal carcass support frame as claimed in either one of claims 1 and 2, wherein the front frame part comprises an upper transverse member and means on said upper member to hold the front hocks of the carcass and members extending downwardly on either side from the upper transverse member and wherein said neck support part bridges the lower ends of said downward members on either side.

4. An animal carcass support frame as claimed in any one of claims 1 to 3, wherein the neck support part is raisable and/or lowerable to raise and/or lower the front part of the carcass on the front frame part from below the neck or shoulders thereof.

5. An animal carcass support frame as claimed in any one of claims 2, 3 and 4 when dependent directly or indirectly on claim 2, wherein pivotal movement of the rear frame part is actuated by a hydraulic or pneumatic ram.

6. An animal carcass support frame for holding and positioning a carcass substantially as illustrated in Figs 1 to 4 of the accompanying drawings and described herein with reference thereto.

7. An animal carcass support frame as claimed in any one of claims 1 to 6, together with an industrial robot comprising a robotic arm equipped with a cutting tool for

dressing the carcass and programmed to carry out dressing operations on the carcass.

8. An animal carcass support frame and industrial robot as claimed in claim 7, wherein the robot is programmed to carry out at least the front Y-cut down the front legs and chest of the carcass.

9. An animal carcass support frame and industrial robot as claimed in either one of claims 7 and 8, wherein the robotic arm is equipped with a cutting tool comprising two parallel, adjacent cutting blades reciprocally movable in the same plane each beside the other, and a motor under control of the robot which drives the cutting blades during cutting operations.

10. An animal carcass support frame and industrial robot as claimed in claim 9, wherein the cutting blades are reciprocally movable in the same plane beside each other with a rotary action.

11. A cutting tool for equipping to a robotic arm of an industrial robot, the cutting tool being manipulatable and operable under control of the industrial robot, comprising two parallel adjacent cutting blades reciprocally movable in the same plane each beside the other and a motor which drives the cutting blades, the cutting blades and motor being formed as a unit

attachable to the robot arm, and means to attach the cutting tool to the robot arm.

12. A cutting tool as claimed in claim 11, wherein the cutting blades are reciprocally movable in the same plane beside each other with a rotary action.

13. A cutting tool as claimed in either one of claims 11 and 12, wherein the cutting blades each comprise a first blade portion providing a first part of the cutting edge of the cutting blade and a second blade portion cranked relative to the first blade portion and providing a second part of the cutting edge of the cutting blade.

14. A cutting tool as claimed in claim 13, wherein said second blade portion of each cutting blade is formed with a shark tooth cutting edge, the teeth of which point back towards the first blade portion of the cutting blade.

15. A cutting tool as claimed in any one of claims 1 to 14, wherein the motor which drives the cutting blades is an air motor.

16. A cutting tool for equipping to a robotic arm of an industrial robot, substantially as illustrated in Fig. 6 of the accompanying drawings and described herein with reference thereto.

17. A method of dressing a carcass comprising suspending the carcass in an inverted position from the front and rear hocks of the carcass, and carrying out dressing operations on the carcass by an industrial robot comprising a robotic arm equipped with a cutting tool for dressing the carcass.

18. A method as claimed in claim 17, including carrying out a Y-cut down the front legs and chest of the carcass by said industrial robot.

19. A method as claimed in either one of claims 17 and 18, wherein the robot is equipped with a cutting tool as claimed in any one of claims 11 to 16.

20. A method as claimed in any one of claims 17 to 19, wherein the carcass is suspended in said inverted position and is raised and lowered by a frame as claimed in any one of claims 1 to 6.

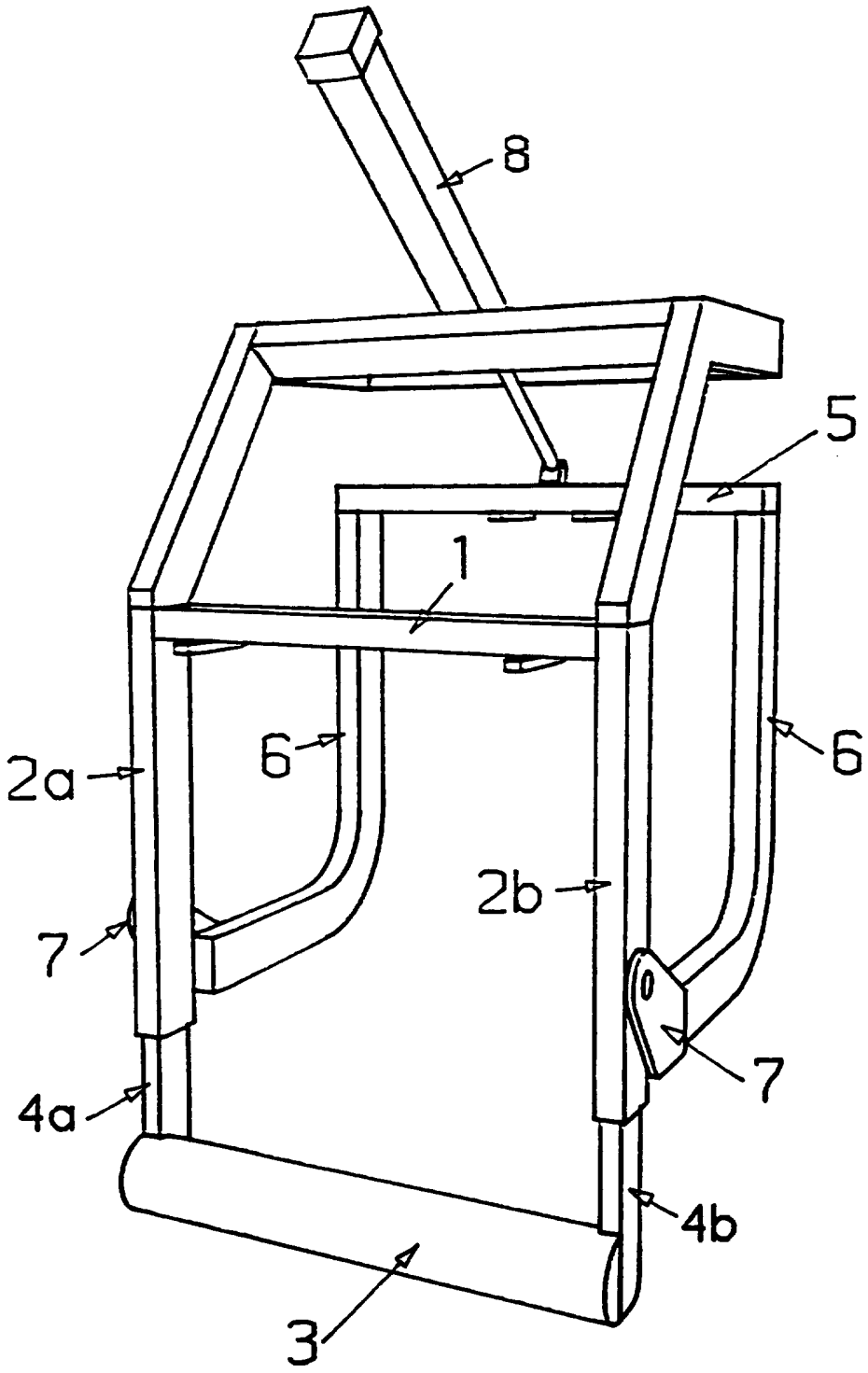

FIG 1

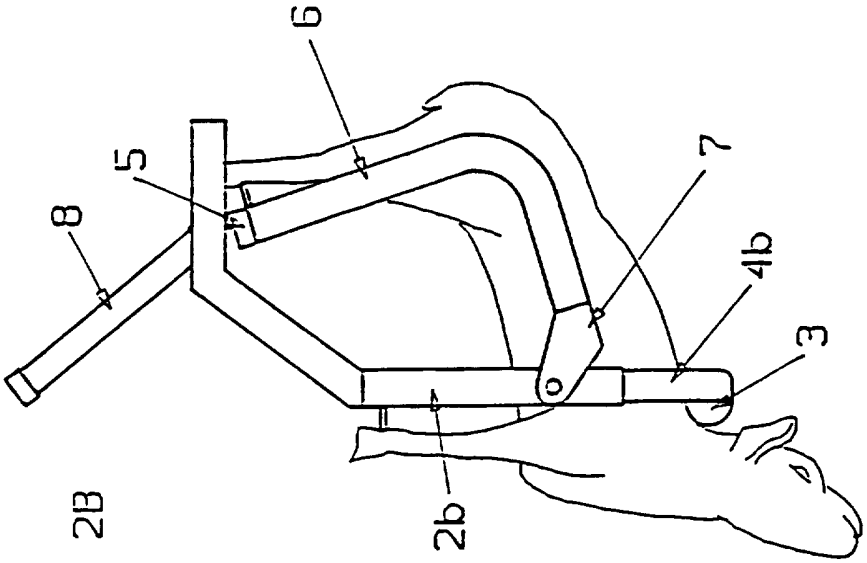

FIG 2B

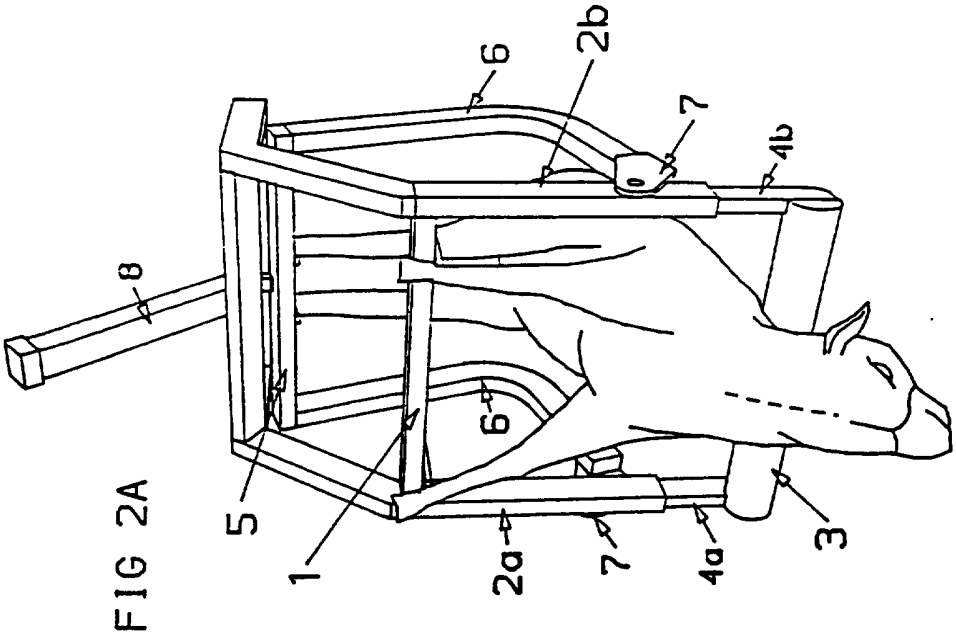

FIG 2A

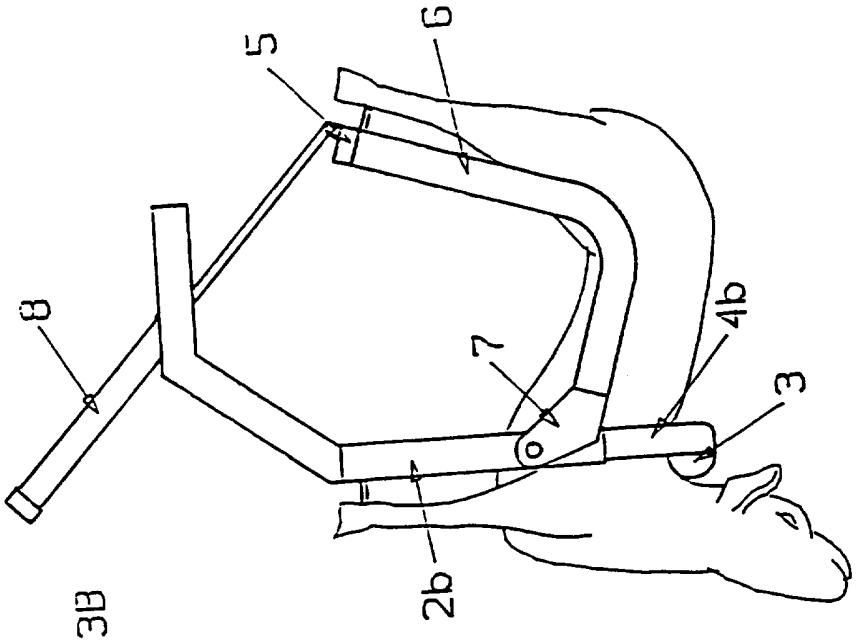

FIG 3B

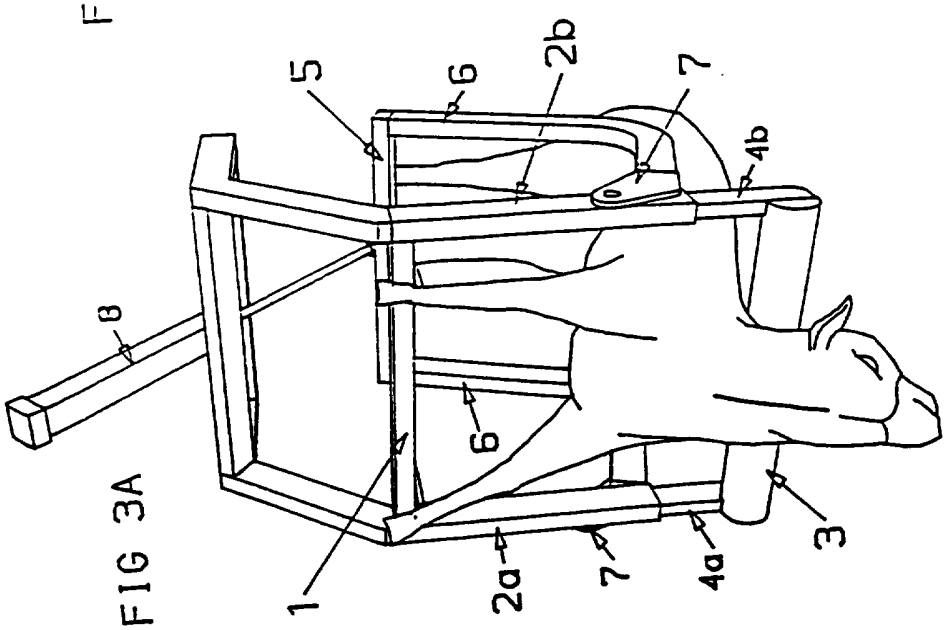

FIG 3A

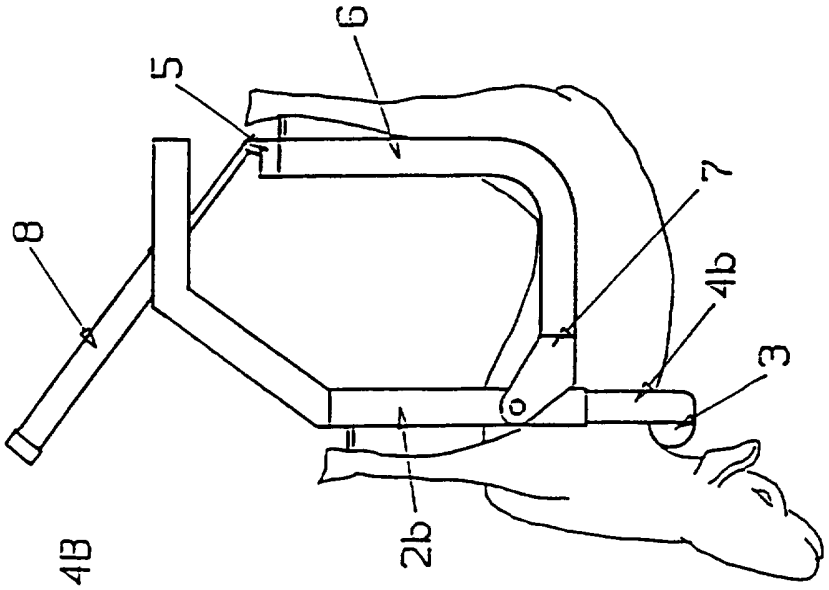

FIG 4B

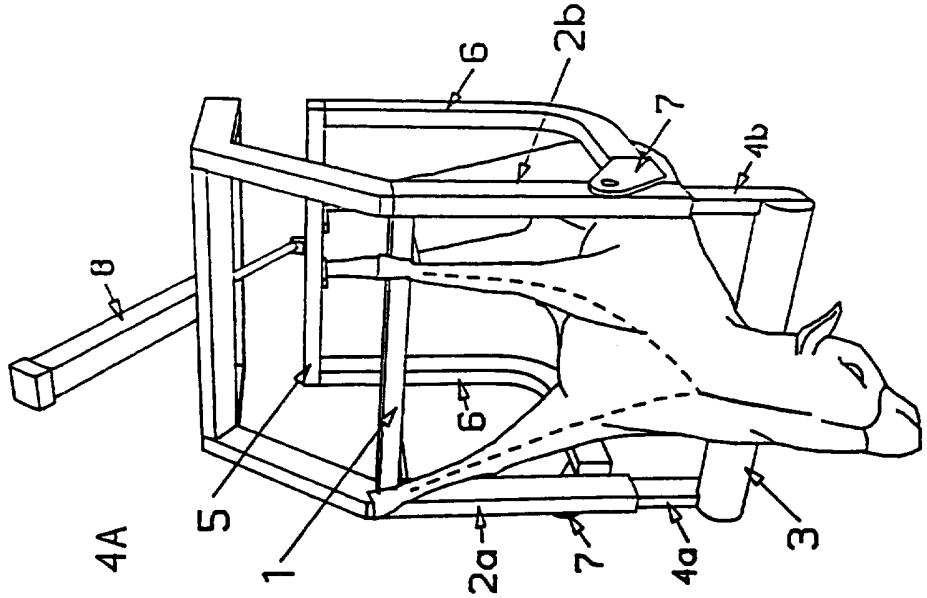

FIG 4A

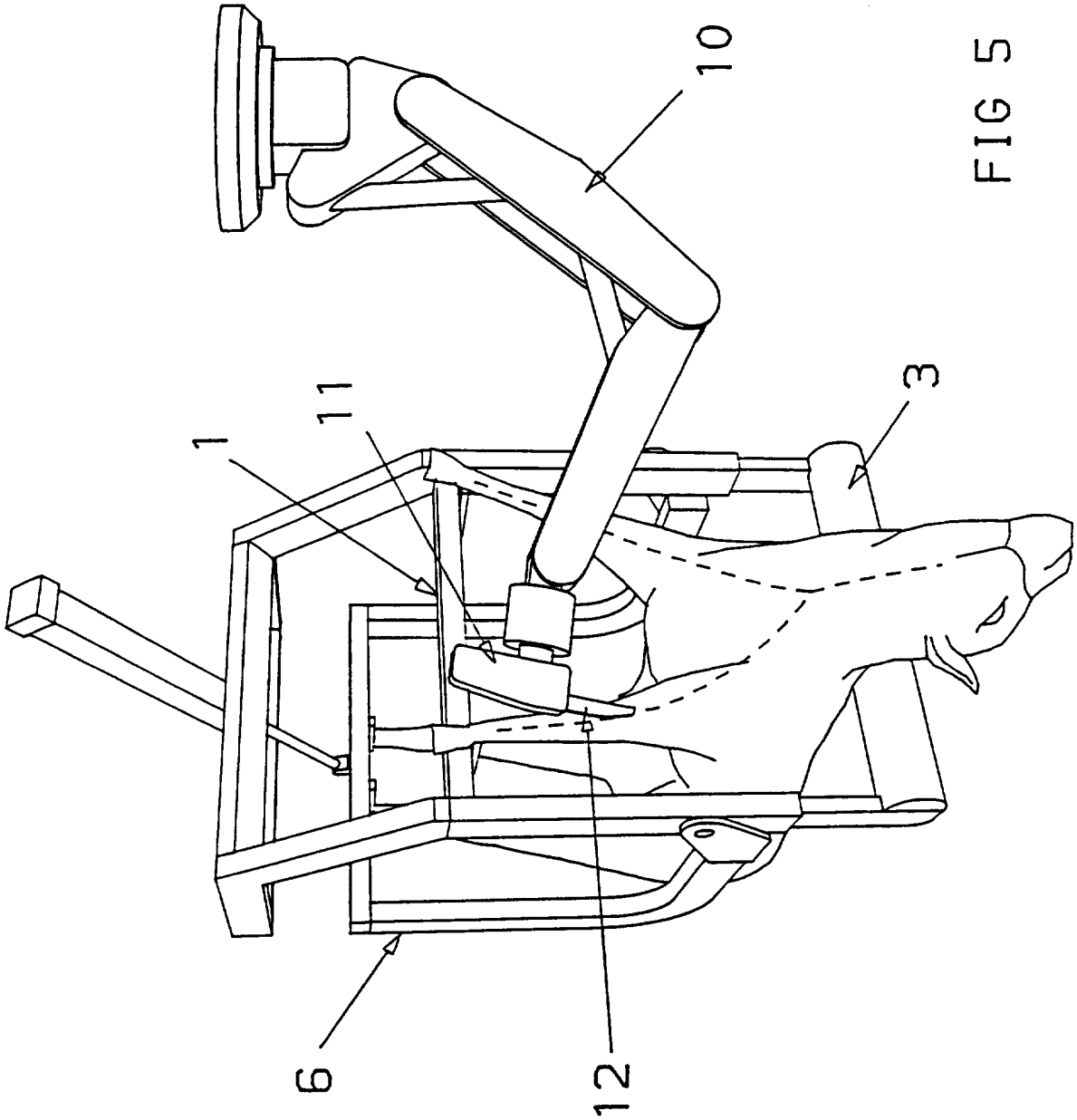

FIG 5

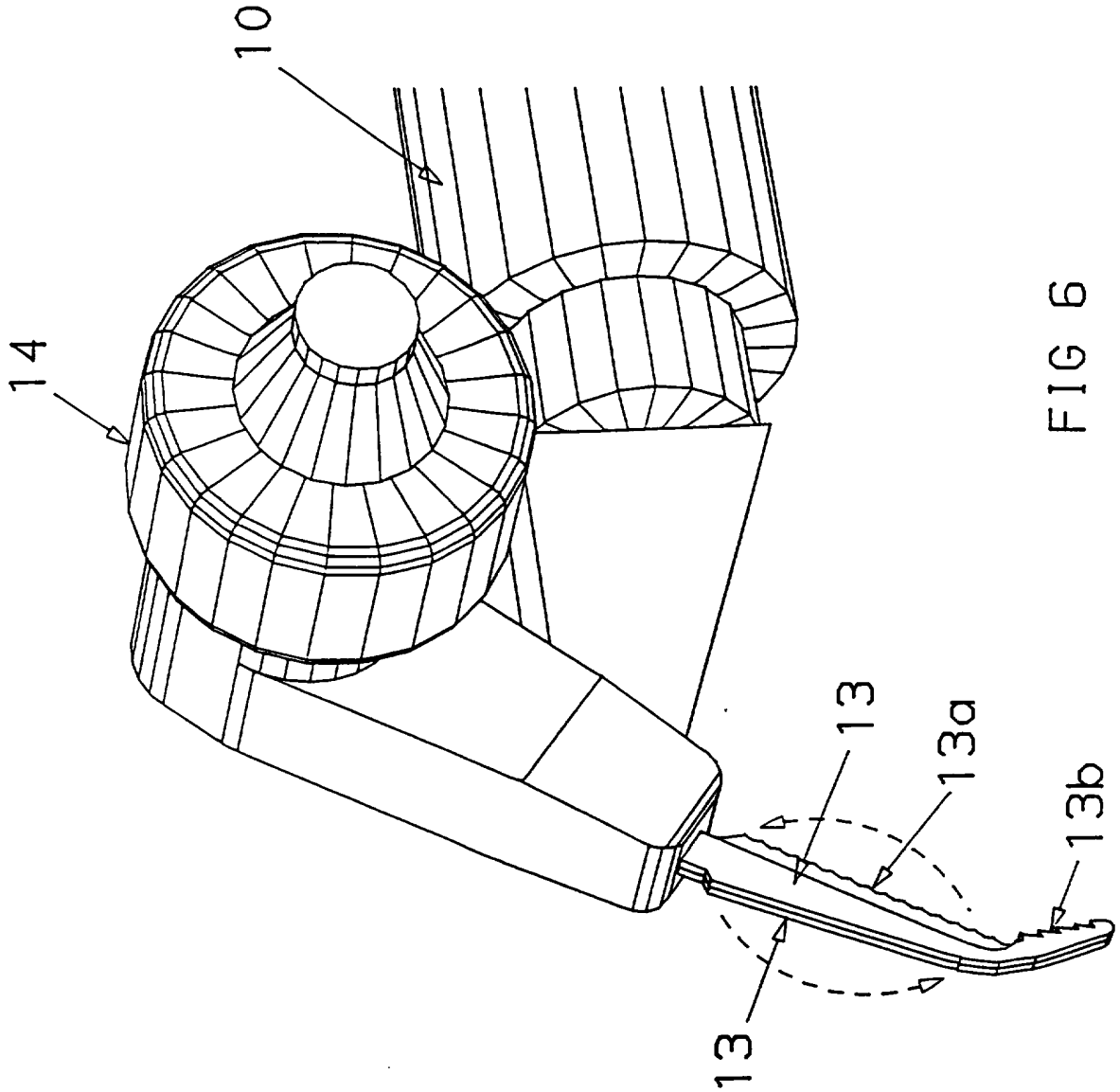

FIG 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ 94/00072

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl.[6] A22B 5/06, A22B 5/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC : A22B 5/06, A22B 5/16

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU : A22B 5/-

Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
	WO,A, 89/05584 (COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH & DEVELOPMENT ORGANSITION, AUSTRALIAN MEAT AND LIVESTOCK RESEARCH AND DEVELOPMENT CORPORATION) 29 June 1989 (29.06.89)	
X	See whole document	17
Y	page 3, lines 23-35	11, 12, 15
A		8
A	page 13, line 1 - page 14, line 24	1-7

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 January 1995 (19.01.95)	7 Feb 1995 (7.2.95)

Name and mailing address of the ISA/AU	Authorized officer
AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA	G.M. COX
Facsimile No. 06 2853929	Telephone No. (06) 2832484

Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
A	AU,A, 76207/91 (COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION, AUSTRALIAN MEAT AND LIVESTOCK RESEARCH AND DEVELOPMENT ORGANISATION) 1 August 1991 (01.08.91) page 2, line 30 - page 3, line 35	1-7
Y	EP 577148 (JARVIS PRODUCTS CORPORATION) 5 January 1994 (05.01.94) The whole document	11, 12, 15
Y	EP 438982 (JARVIS PRODUCTS CORPORATION) 31 July 1991 (31.07.91) The whole document	11, 12, 15
Y	US 4901400 (KARUBIAN, Ralph K.) 20 February 1990 (20.02.90) The whole document	11, 12, 15
Y	AU,A 71269/81 (WETZEL, L. & MAMMEL, F.) 10 December 1981 (10.12.81) The whole document	11, 12, 15
Y	AU,B, 10140/66 (412696) (WETZEL) 29 February 1968 (29.02.68) The whole document	11, 12, 15
Y	US 3176397 (SCHUHMANN, Kurt) 6 April 1965 (06.04.65) The whole document	11, 12, 15
Y	AU,B, 58644/60 (238286) (THE UNIVERSAL FLAYMASTER EQUIPMENT COMPANY LIMITED) 22 September 1960 (22.09.60) The whole document	11, 12, 15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ 94/00072

Box I **Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)**

This internati rch report has not established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ laims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II **Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

See subsequent sheet.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically

claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

(continuation of Box II)

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are two inventions:

1. Claim 1-6 are directed to an animal carcass support frame for holding an positioning an animal carcass during operation. It is considered that neck support part of the support frame comprises a first "special technical feature".

2. Claims 7-10 are directed to a collocation of an animal carcass support frame and an industrial robot comprising a robotic arm equipped with a cutting tool.

Claims 11-16 are directed to a cutting tool for equipping to a robotic arm of an industrial robot.

Claims 17-20 are directed to a method of dressing a carcass using a cutting tool attached to an industrial robot.

It is considered that the cutting tool for an industrial robot is a second "special technical feature".

As such it is considered that the two sets of Claims (1-6 and 7-20) do not share a single special technical feature and accordingly the application does not relate to one invention or to a single inventive concept.

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
AU	71269/81	AR	223292	AT	11202	BR	8103434
		DE	3020878	DE	3168275	EP	41227
		JP	57063046	JP	63045179	US	4368560
EP	438982	AU	51364/90	AU	15921/92	EP	577148
		JP	3191742	JP	5047177	US	5122092
EP	577148	AU	51364/90	AU	15921/92	EP	438982
		JP	3191742	JP	5047177	US	5122092
AU	76207/91						
US	4901400						
WO	89/05584	AU	29199/89	AT	101487	CA	1323147
		CA	1326335	CA	1327434	DE	3887903
		DK	1533/90	EP	397703	EP	508550
		EP	508551	EP	509613	EP	397703
		NZ	227497	NZ	235513	NZ	235514
		NZ	235515	US	5062820	US	5195923
		US	5312292	US	5139457		

END OF ANNEX