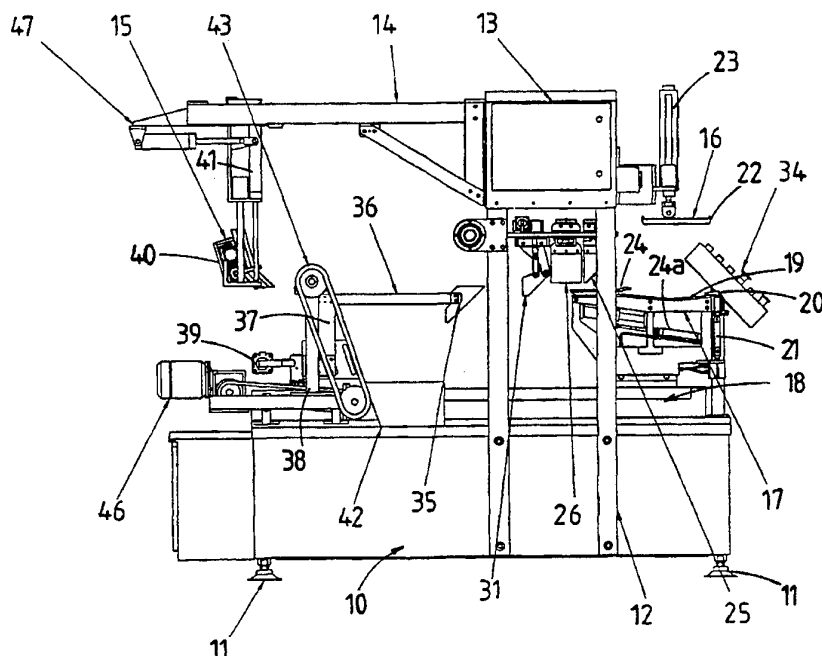




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/NZ94/00015</p> <p>(22) International Filing Date: 4 March 1994 (04.03.94)</p> <p>(30) Priority Data: 247063 4 March 1993 (04.03.93) NZ</p> <p>(71) Applicant (for all designated States except US): THE MEAT INDUSTRY RESEARCH INSTITUTE OF NEW ZEALAND (INCORPORATED) [NZ/NZ]; East Street, Hamilton 2001 (NZ).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): HILL, Harold, Keith [NZ/NZ]; 23 Cricket Place, Hamilton 2001 (NZ). CORLETT, Owen [NZ/NZ]; Flat 1, 75 Albert Street, Hamilton 2001 (NZ). HINTZ, Ian, Staniland [NZ/NZ]; 50 Northolt Road, Hamilton 2001 (NZ). McCARTHY, Grant, Michael [NZ/NZ]; 37 Gordon Heights Avenue, Hamilton 2001 (NZ). NG, Weng, Yew [NZ/NZ]; Eureka Road, R D 4, Hamilton 2001 (NZ).</p> <p>(74) Agents: HOPKINS, Donald, Leslie et al.; P.O. Box 376, Palmerston North 5330 (NZ).</p>	<p>(81) Designated States: AT, AU, BR, CA, CN, DE, DK, ES, GB, HU, JP, KR, NL, NO, PT, SE, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p><b>Published</b> With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>	

## (54) Title: A METHOD AND MEANS OF BONING MEAT



## (57) Abstract

An apparatus and method for removing meat from the shoulder area of an animal carcass. The apparatus has a support (17) for the shoulder and cutting elements (25) for applying a cut to the side of the dorsal projections of the shoulder. Plough elements (26) are included for removing meat at least partially from the shoulder in the vicinity of the vertebrae. Rib clearing elements (35) remove meat at least partially from the ribs and include a locating portion for correct location of said rib clearing elements upon engagement with the shoulder. Further rib clearing elements (36) enable remaining meat to be removed from the ribs.

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A METHOD AND MEANS OF BONING MEAT

This invention relates to a method and means of removing meat from an animal carcass and more particularly removal  
5 by mechanical means of the meat from the shoulder area of the carcass.

While the present invention is useful for removal of meat from the area of the shoulder of animal carcasses in  
10 general it is particularly applicable to ovine carcasses. While the following will concentrate more specifically on removal of meat from the shoulder area of an ovine carcass the invention is not limited solely thereto.

15 The operation of removing meat from the shoulder area of an animal carcass is commonly referred to as shoulder fleecing. At the present time a shoulder is fleeced by removing the meat manually by a meat process worker. The yield of meat is thus very much dependent on the skill of  
20 the worker. Consequently yields are often quite variable with the result that at times a substantial amount of meat is left on the bone.

The prime object of the present invention is thus to  
25 provide a method and means for shoulder fleecing using mechanical means and to obtain a consistently high yield of meat.

According to one broad aspect of the invention there is  
30 provided a method of removing meat from the shoulder area of an animal carcass the method including the steps of at least partially clearing meat from the cervical and thoracic vertebrae, using mechanical clearing means to essentially clear remaining meat therefrom, and, in  
35 response to determining a location on the carcass, causing mechanical clearing means to remove at least part of the meat from the area of the ribs thereof.

In a second broad aspect of the invention there is provided apparatus for removing meat from the shoulder area of an animal carcass, the apparatus comprising support means for the shoulder, cutting means for applying a cut to the side  
5 of the dorsal projections of the shoulder, clearing means for removing meat at least partially from the shoulder in the vicinity of the vertebrae, rib clearing means for removing meat at least partially from the ribs and means  
10 for correct location of said rib clearing means upon engagement thereof with the shoulder.

In the following more detailed description of the invention reference will be made to the accompanying drawings in  
15 which:-

Figure 1 is a perspective view of the shoulder area of an ovine carcass prior to a boning operation being effected,  
20 Figure 2 is a similar view to Figure 1 but showing meat separated from the bones in accordance with the present invention in accordance with the  
Figure 3 is a side view of a machine in accordance with the present invention whereby meat removal as  
25 illustrated in Figure 2 can be effected,  
Figure 4 is a front end view of the machine shown in Figure 3,  
Figure 5 is a detailed side elevation of part of the machine shown in Figures 3 and 4,  
30 Figure 6 is a further detailed view of part of the machine shown in Figures 3 and 4,  
Figure 7 is an elevation view from the other side of the detail shown in Figure 6,  
Figure 8 is a detailed view similar to Figure 5 showing a modified form of the machine,  
35 Figure 9 is a view similar to Figure 6 of the modified form shown in Figure 8, and

Figure 10 is a view similar to Figure 7 once again showing the modified form of Figure 8, and Figures 11a and 11b are respectively elevation and end views of the rib clearing knives according to a preferred form.

The method according to the present invention essentially consists of the steps of placing the shoulder S (Figure 1) onto a support and causing relative movement between shoulder S and cutting/clearing elements such that the meat is cleared simultaneously from each side of the shoulder S as shown in Figure 2. Such method includes the steps of forming cuts along the length of the shoulder each side of the dorsal protrusions of the vertebrae followed by clearing the meat from around the neck and then along the upper regions of the rib cage. Further relative movement between the shoulder S and clearing means results in the meat being removed from the remainder of the ribs to thereby result in complete removal of the meat in a section from each side of the ribs and neck as shown in Figure 2.

A machine operable in accordance with the method is shown generally at Figures 3 and 4. A chassis 10 which stands on feet 11 mounts an upwardly projecting support frame 12. Atop the frame 12 is a cabinet 13 which houses equipment such as a PLC, pneumatic controls and the like. Extending rearwardly from cabinet 13 and above chassis 10 are rails 14 of a pick and place mechanism indicated generally at 15. The support frame 12 and cabinet 13 arrangement also provides a mounting for a neck press shown generally at 16.

A movable product support 17 is mounted by a suitable guide arrangement located within chassis 10. Product support 17 incorporates an uppermost engagement surface 19. Shoulder S is placed on the support 17 so that the ribs thereof extend downwardly either side of the support with the

underside of the spine (vertebrae) engaging on the elongate support surface 19.

5 A pin 20 at the trailing end of elongate support surface 19 is controlled by a pneumatic ram (shown generally at 21). Pin 20 is engageable in the spinal cord opening O (see Figures 1 and 2).

10 Body press mechanism 16 incorporates a pad 22 carried by the piston rod of a pneumatic ram 23. When ram 23 is actuated pad 22 is lowered so as to engage with the upper top surface of shoulder S (which is located on product support 17). Neck N is thereby forced downwardly into contact with the engagement surface 19 whereupon a second  
15 pin 24 (also controlled by a pneumatic ram 24a) is able to be actuated and engage in the end of the spinal cord opening O opposite to that in which pin 21 is engaged. Pins 21 and 24 thereby locate the shoulder S in place during movement of support 17.

20

With the shoulder S held in place on support 17 relative movement between the shoulder and cutting/clearing elements takes place. In the preferred form of the invention support 17 is moved along guide 18 so that the shoulder S  
25 moves and the cutting/clearing mechanisms remain stationary relative thereto.

As support 17 proceeds a pair of spaced apart knives 25 engage with the neck end of the shoulder S and form cuts  
30 which extend either side of the dorsal projections D of the cervical and thoracic vertebrae V. Immediately following knives 25 are spaced apart ploughs 26 which clear the muscle in the vicinity of the dorsal projections D where they merge into the neck bones and very top of the ribs R.

35

Associated with ploughs 26 are contact surfaces 27. All of the aforementioned are carried by a mount 28 (see Figures 4

and 5) which is pivotally coupled to a transverse support shaft 29. The front of mount 28 is supported by couplings to a pair of pneumatic rams 30. During movement of the shoulder S relative to knives 25 and ploughs 26 the contact surfaces 27 engage with the uppermost surface of shoulder S in the vicinity of where the cutting and ploughing action is taking place so that as a result of the downward pressure applied by rams 30 to mount 28 the ploughs press against the bone. The pressure is such that there is an interaction between the ploughs and the bones to the extent that clean and effective removal of the muscle from the bone takes place.

Located behind ploughs 26 are a pair of neck knives 31. These are coupled to pneumatic rams 32a and 32b such that the knives can be (a) lowered to a working position and raised to a non working position (as shown in Figure 3) by rams 32a and (b) when in the lowered position brought toward each other by rams 32b such that the knives 31 are correctly positioned relative to the neck bones.

The neck knives 31 are profiled so that they clear the muscle around the portion of the neck bones not cleared by ploughs 26. Sensing means are provided such that the neck knives 31 are moved apart (by rams 32b) and then raised (by rams 32a) prior to the knives coming into contact with the leading rib bones. Otherwise knives 31 would dig into and shear off the ribs.

The sensing means can be in the form of a light beam which projects across the machine and which is broken as the juncture of the neck and the thorax passes therethrough. By suitable electronic control the breaking of the light beam results in a time delay prior to actuation of pneumatic rams 32a and 32b to raise the neck knives.

The control mechanism is preferably constructed such that the machine operator can adjust the time delay. Thus the operator can determine the type of animal carcass (lean, medium or fat) and by pressing appropriate buttons on a console 34 can select the time delay so as to ensure that neck knives 31 are retracted at the correct point in time. This avoids retraction taking place too early thereby resulting in loss of yield and an untidy cut and retraction too late thereby preventing the neck knives making contact with the ribs.

The next clearing element to come into contact with shoulder S are a pair of rib knives 35. These are each conveniently mounted to one end of a brisket knife 36.

Rib knives 35 are shaped so as to be able to follow the contours of that part of the ribs with which they contact (see figures 11a and 11b which illustrate one preferred form of the knives). Also the leading edge portion 50 at the upper part of the rib knife 35 curves over. This leading edge (50) thus comes into engagement with the cleared neck bones to ensure correct positioning of the rib knives such that they correctly come into contact with the ribs to ensure best removal of muscle from the ribs.

Brisket knives 36 are of elongate form and are attached at their other ends to upwardly projecting supports 37. The supports 37 are hingedly mounted at their lower ends to fixed mounts 38. A pneumatic ram 39 is connected between the lower ends of supports 37. Ram 39, when operated, thus can move knives 36 (and hence rib knives 35) toward one another as the shoulder commences to move therebetween. Ram 39 also provides a pressure to ensure that the rib knives 35 closely engage with but do not dig into the ribs. Once the rib knives 35 have cleared muscle from the ribs R forward movement of support 17 ceases whereupon relative movement between the carcass C and the brisket knives 36



takes place. This according to the preferred form of the invention is effected by a pick and place gripper 40 engaging with the neck bones of the carcass C. Pneumatic ram 41 moves the pick and place gripper 40 upwardly which  
5 draws carcass C upwardly between knives 36. As a result the brisket knives 36 move over the remainder of the ribs to thereby force off the meat.

The meat sections forced off the ribs consequently drop  
10 into buckets 42. The buckets 42 are then moved upwardly by elevators 43 with the result that the meat is thrown from the buckets into a receptacle, conveyor, table or the like to the rear of the machine. The elevator is operated by an elevator drive motor 46.

15 During operation of the pick and place mechanism 15 support 17 returns to its loading or rest position ready for a further shoulder S to be loaded thereon. The pick and place mechanism 15 is then moved along rails 14 by a  
20 suitable drive mechanism to the position shown in Figure 3. Ram 47 then pivots the pick and place gripper 40 rearwardly whereupon the gripper releases its hold on the bone so as to release the bones to the rear of the machine.

25 The machine according to the present invention thus provides a mechanical means of rapidly performing an automatic sequence of operations on the shoulder to carry out the fleecing operation in an effective and efficient manner. By virtue of the sequenced operation of the  
30 cutting knives, ploughs and the ability to adjust the operation to account for lean, medium and fat animals consistently high yields of meat removal can be obtained.

The invention is open to modification as will be  
35 appreciated by those skilled in the art. For example knives 25 and ploughs 26 can be formed as a single unit.

By way of a further example reference is made to Figures 8, 9 and 10. In this modified form part of plough 26 is combined with knife 25 this part of the plough being identified by reference numeral 26A in Figures 8, 9 and 10.

5 The remainder of the plough is a separate item located to the other side of neck knife 31 and is identified at 26B. Second plough part 26B is mounted by a rearwardly projecting arm 48 which is pivotally mounted about pivot 49. Plough part 26B carries or is provided with a

10 transverse wing at its lower end (see Figure 10).

A small ram (not shown) controls the up and down movement of arm 48 about pivot 49. Thus plough 26B can be lowered so that it comes into contact with the bone and a downward

15 pressure can be maintained to ensure this contact continues as the plough moves over the bone. Hence best clearing action of the plough is achieved.

According to this modified form the separation of the

20 plough into two sections avoids the possibility that the plough may act on the meat in such a way as to adversely affect the cutting action of the following neck knives 31. Thus with the modified form only limited clearing by ploughs 26A takes place prior to knives 31 carrying out

25 their cutting action. The remainder of the clearing action in the area of the vertebrae is carried out by plough 26B with its lowermost transverse wing.

## CLAIMS

1. A method of removing meat from the shoulder area of an  
5 animal carcass the method including the steps of at least  
partially clearing meat from the cervical and thoracic  
vertebrae, using first mechanical clearing means to  
essentially clear remaining meat therefrom, and, in  
10 response to determining a location on the carcass, causing  
second mechanical clearing means to remove at least part of  
the meat from the area of the ribs thereof.
2. The method of claim 1 wherein the shoulder is moved  
relative to mechanical cutting elements to form cuts along  
15 each side of the vertebrae followed by clearing of meat  
from the neck area and along the upper regions of the rib  
cage by said first and second clearing means.
3. The method of claim 2 wherein upon the clearing of  
20 meat from the upper region of the rib cage said shoulder is  
moved in a different direction relative to further clearing  
means which complete the removal of meat from the rib cage.
4. The method of claim 1, 2 or 3 wherein the step of  
25 determining the location on the carcass is effected by  
bringing the second mechanical means into engagement with  
the cleared neck portion of the carcass.
5. Apparatus for removing meat from the shoulder area of  
30 an animal carcass, the apparatus comprising support means  
(17) for the shoulder (S), cutting means (25) for applying  
a cut to the side of the dorsal projections (D) of the  
shoulder, clearing means (26, 31) for removing meat at  
35 least partially from the shoulder in the vicinity of the  
vertebrae, rib clearing means (35) for removing meat at  
least partially from the ribs (R) and means (50) for

correct location of said rib clearing means upon engagement thereof with the shoulder.

5 6. Apparatus as claimed in claim 5 wherein moving means are provided for causing relative movement between the carcass (S) and the means (25, 26, 31 and 35) for removing meat therefrom.

10 7. Apparatus as claimed in claim 6 wherein the rib clearing means includes at least one first clearing element (35) for the removal of meat at least partially from the ribs in the area of the ribs where they join with the vertebrae.

15 8. Apparatus as claimed in claim 6 or 7 wherein the rib clearing means (35) includes at least a second clearing element (36), there being second moving means (15) for causing relative movement (in a direction different from that of the first mentioned moving means) between the  
20 carcass (S) and said second clearing means (36) to thereby cause meat to be removed from said ribs (R).

25 9. Apparatus as claimed in claim 8 wherein the first moving means is associated with the support means (17) for the carcass (S), said support means being mounted (18) for movement relative to the means (25, 26, 31 and 35) for removing meat in a first direction and the second moving means (15) is associated with a device (40) adapted to grippingly engage with the carcass, said device being  
30 movable by said second moving means in a direction substantially transverse to said first direction.

35 10. Apparatus as claimed in any one of claims 5 to 8 wherein the support means has a support surface (19), a press device (16) for engagement with the neck portion (N) of the carcass (S) to urge same toward the support surface

and retaining means (24) for retaining the neck in such position.

11. Apparatus as claimed in any one of claims 5 to 10  
5 wherein the clearing means is formed by at least one rib  
knife (31) mounted (32a and 32b) to be moved toward and  
away from the neck portion (N) of the carcass (S), there  
being sensing means which upon sensing a part of the  
carcass causes the rib knife to be moved away from the  
10 carcass.

12. Apparatus as claimed in claim 11 further including  
time delay means whereby the rib knife (31) is moved away  
from the carcass (S) a period of time after said part of  
15 the carcass is sensed.

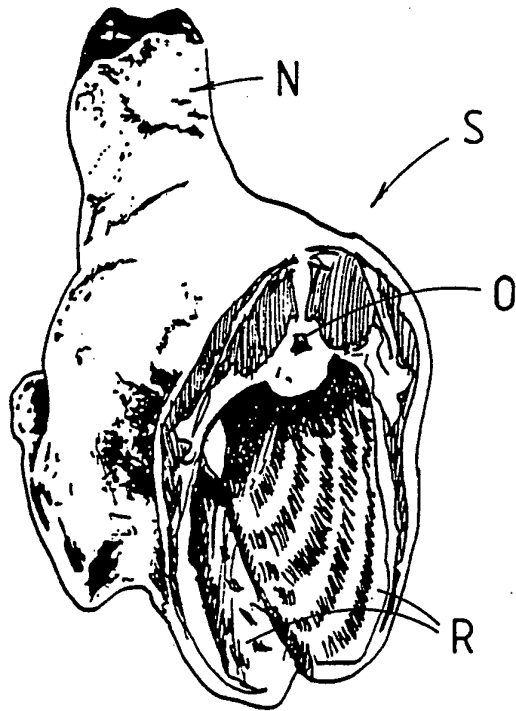
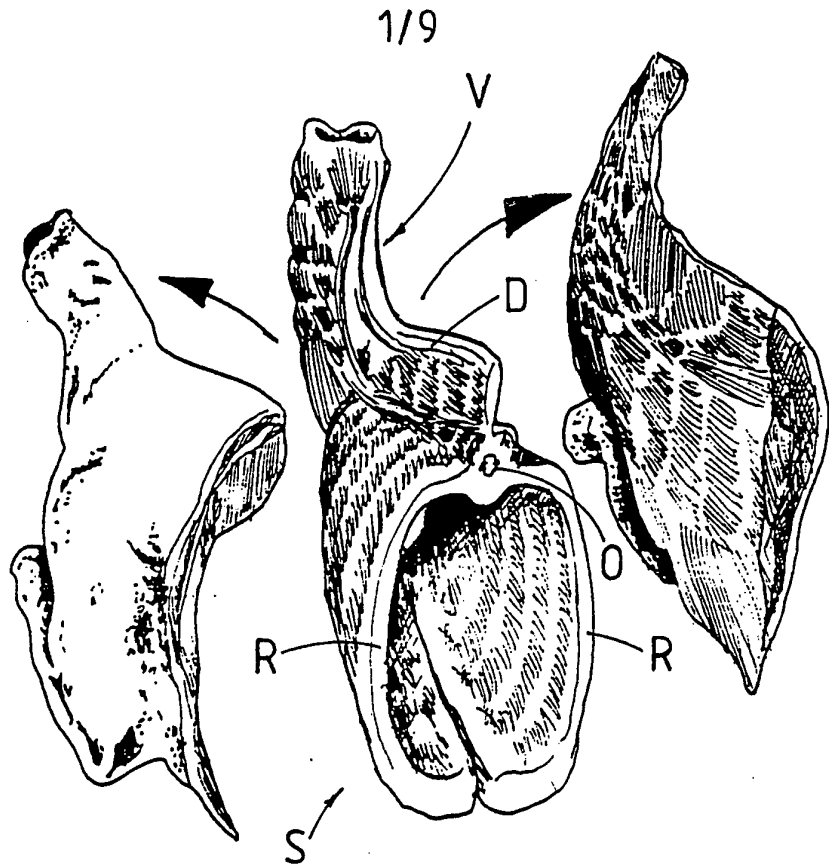
13. Apparatus as claimed in any one of claims 5 to 12  
further including pressure means for causing an interaction  
between the clearing means and bone of the carcass.

20  
14. Apparatus as claimed in claim 11 or 12 wherein the  
clearing means (26) is formed by two plough elements one  
(26A) being engageable with the carcass (S) in advance of  
the rib knife (31) and the other (26B) following after the  
25 rib knife, there being pressure means for causing an  
interaction between one or both of the ploughs and bone of  
the carcass.

15. Apparatus as claimed in claim 5 or 6 wherein the rib  
30 clearing means (35) is a knife and the means for correct  
location is formed by a curved leading portion (50)  
configured to ride over the prior cleared neck bones (N) of  
the carcass (S).

35 16. Apparatus as claimed in claim 15 wherein the rib knife  
(35) is coupled to a movable mount (36) which forms or is  
associated with a second rib clearing knife.

17. Apparatus as claimed in claim 15 or 16 wherein the  
movable mount (37) is associated with pressure applying  
means (39) whereby the rib knives (35, 36) closely engage  
5 with but do not dig into the ribs (R).



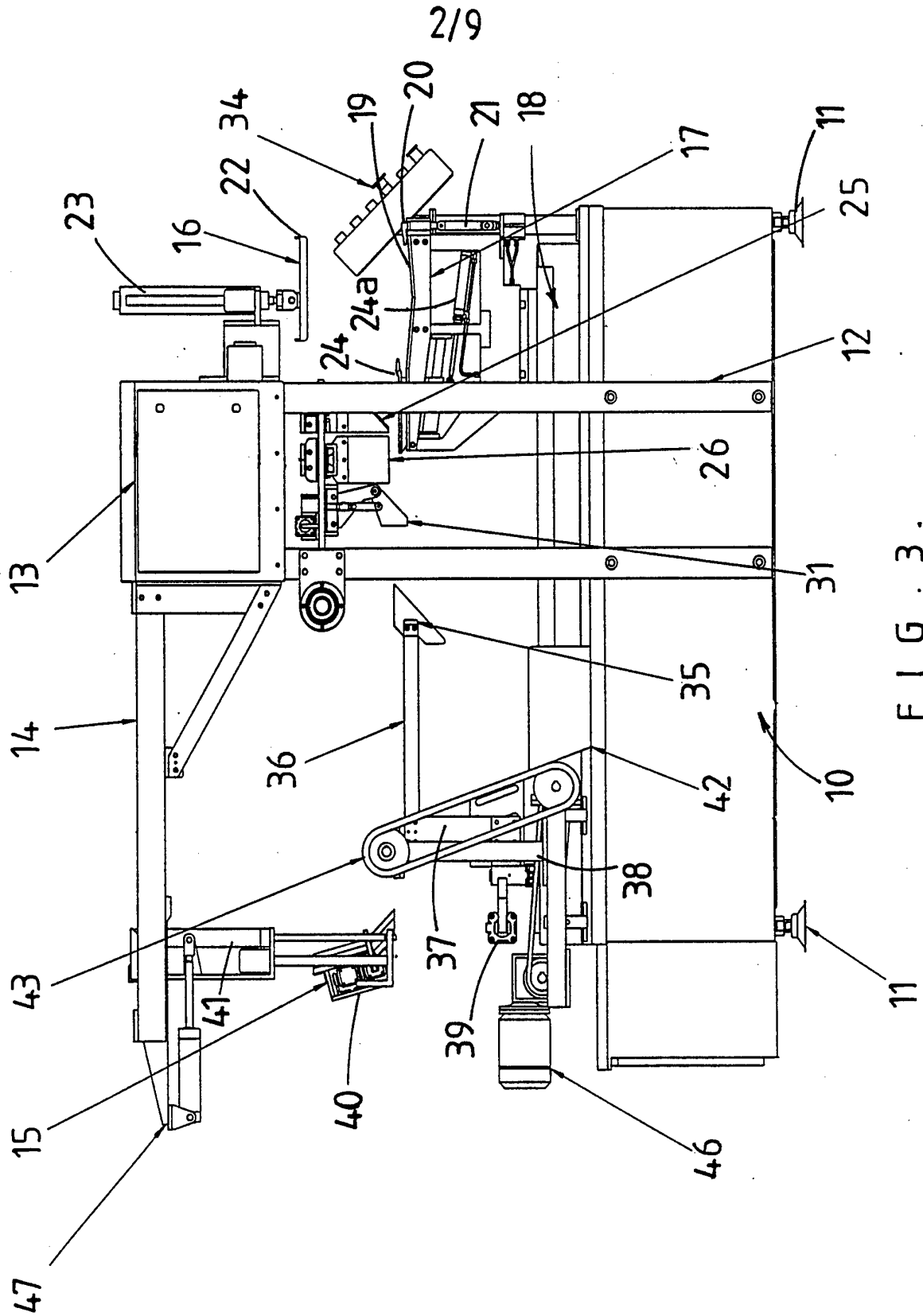


FIG. 3.



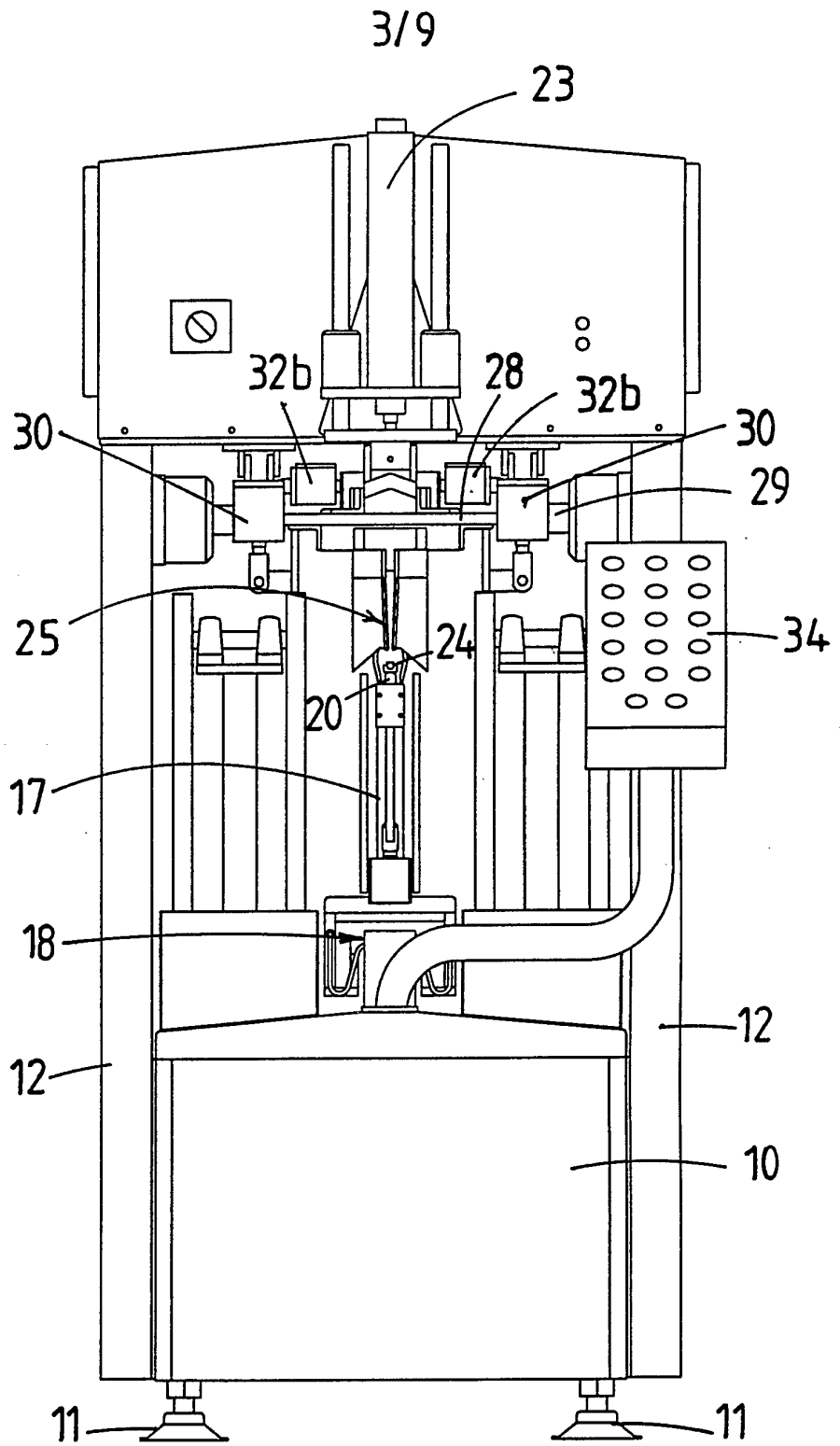


FIG. 4.

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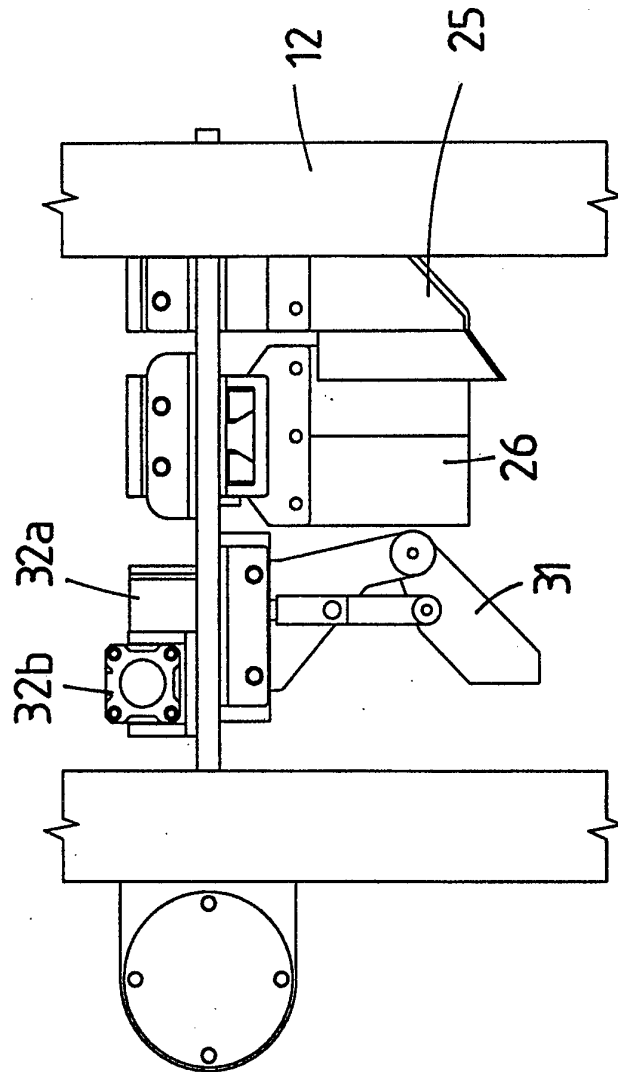


FIG. 5.

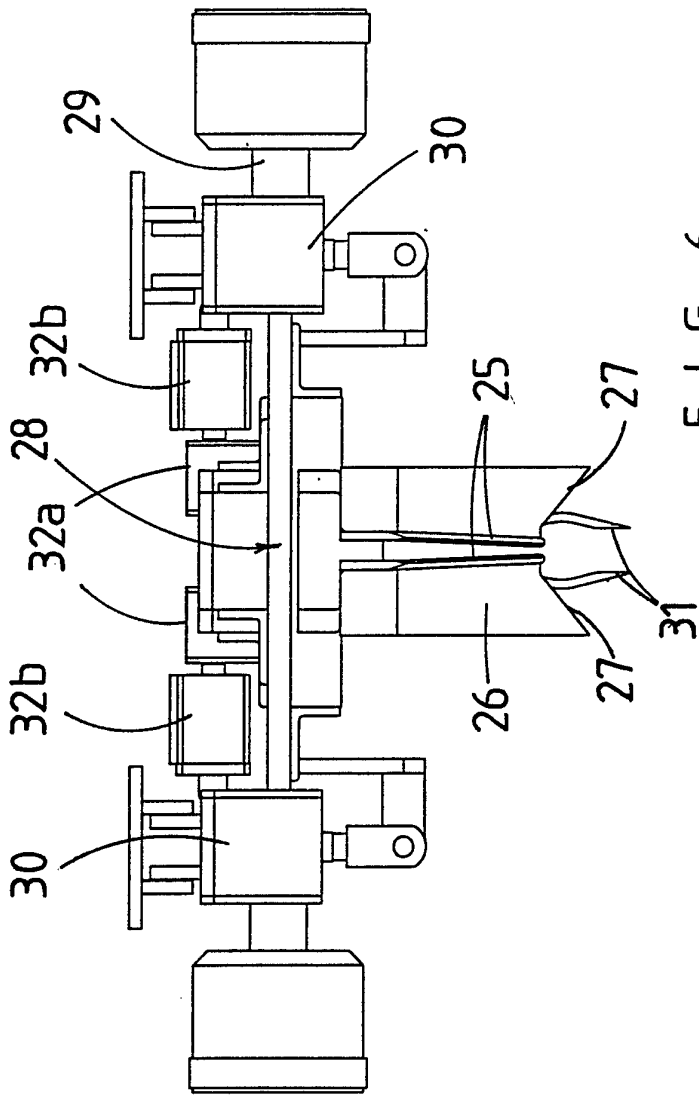


FIG. 6.

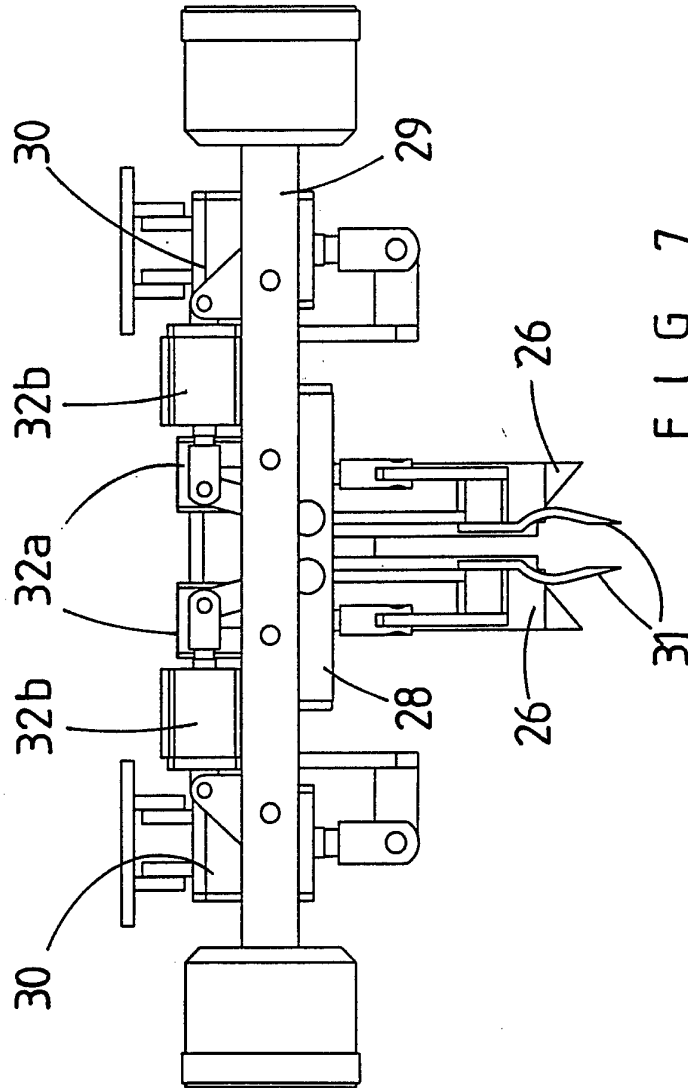


FIG. 7.

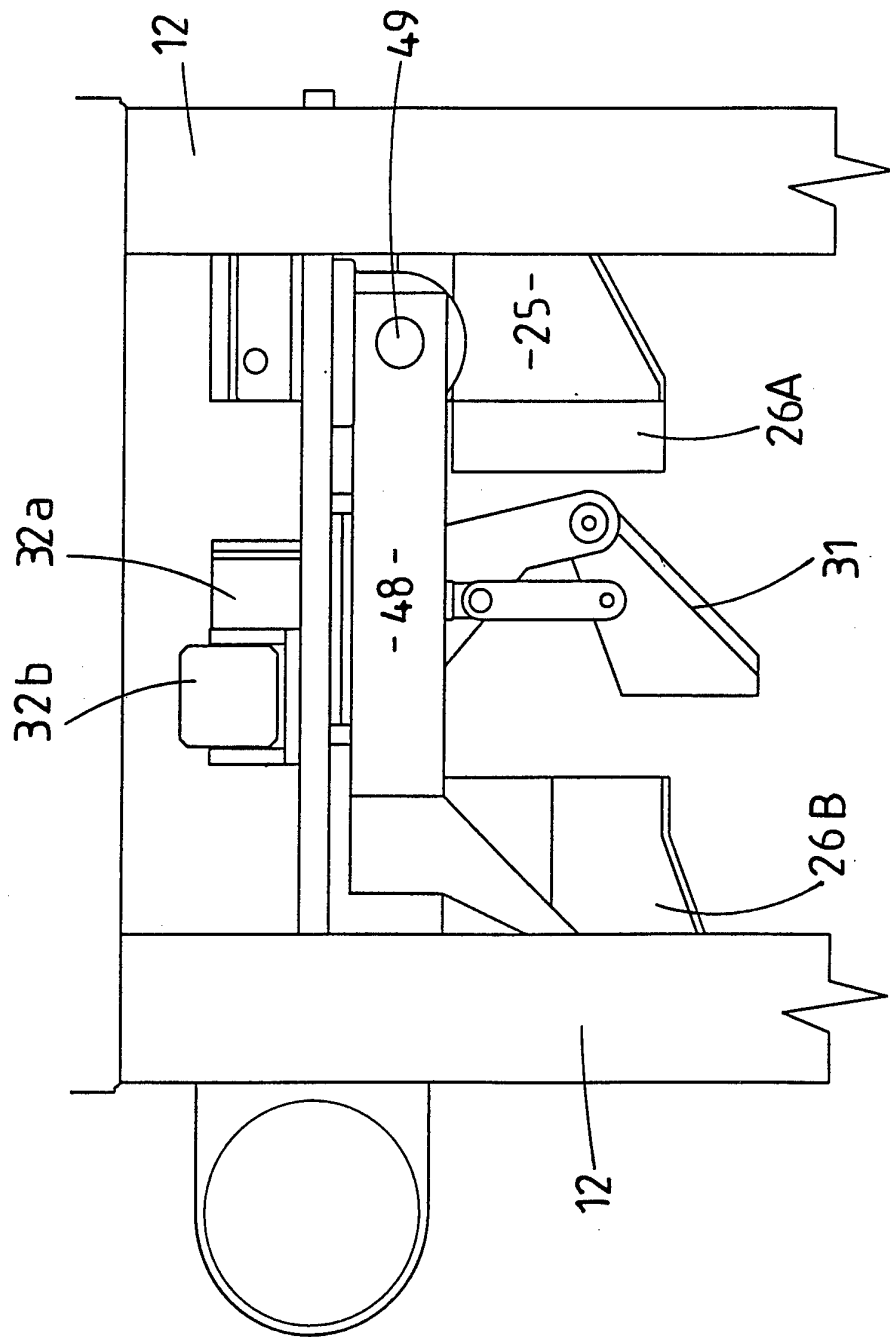


FIG. 8.

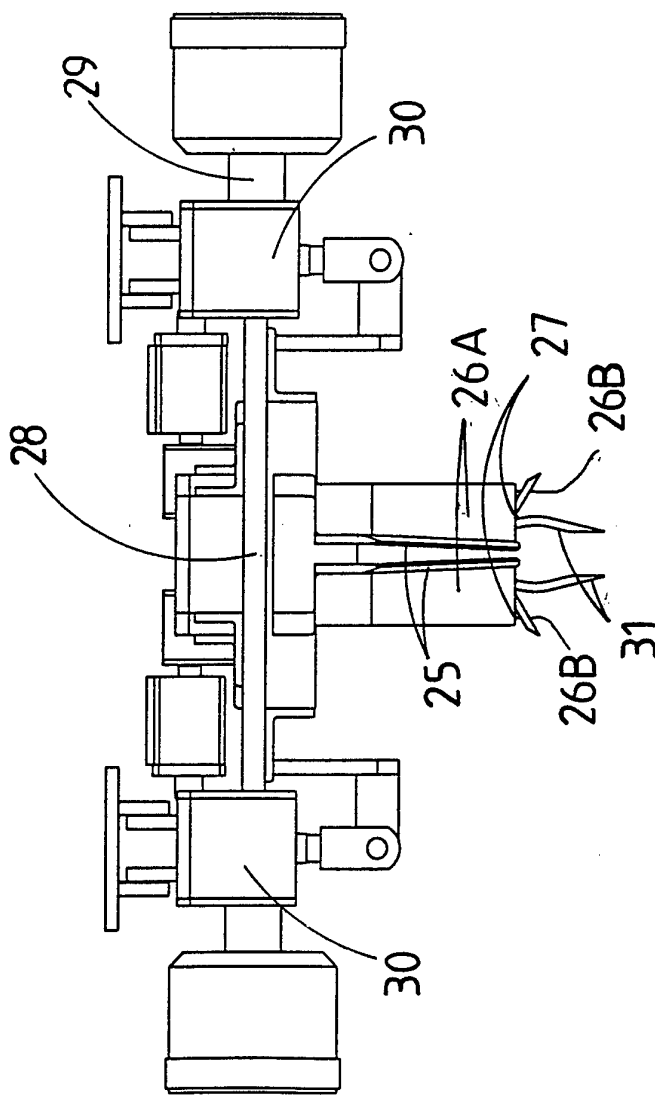


FIG. 9.

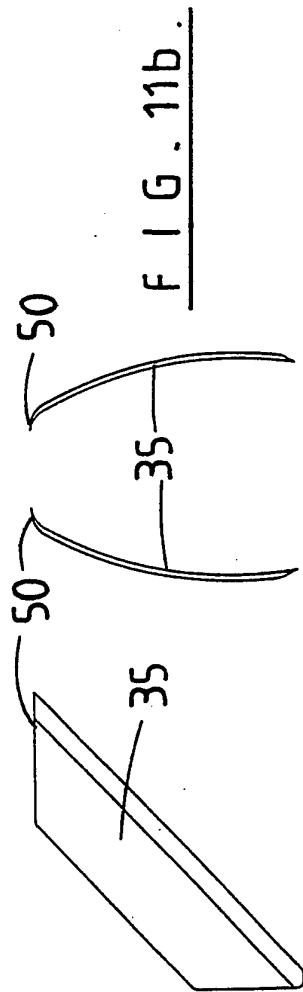


FIG. 11a.

FIG. 11b.

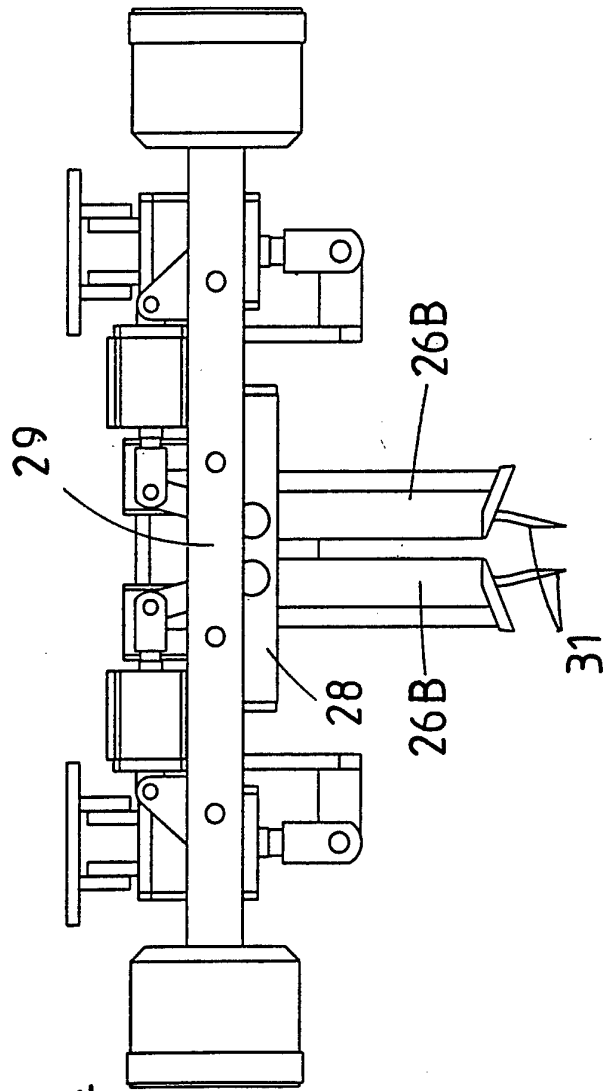


FIG. 10.

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> Int. Cl. <sup>5</sup> A22C 17/02  According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>  Minimum documentation searched (classification system followed by classification symbols) IPC A22C 17/02, 17/04  Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC as above, A22C 18/-  Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	AU,B, 36232/84 (580274) (THE MEAT INDUSTRY RESEARCH INSTITUTE OF NEW ZEALAND INCORPORATED) 13 June 1985 (13.06.85) the whole document	1-8, 10, 11, 13, 15, 16, 17
A	AU,A, 86748/91 (THE MEAT INDUSTRY RESEARCH INSTITUTE OF NEW ZEALAND INCORPORATED) 30 April 1992 (30.04.92) page 2, paragraph 3-page 3, paragraph 3	1, 5
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.		
<input checked="" type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search 24 June 1994 (24.06.94)	Date of mailing of the international search report <u>1 July 1994 (01.07.94)</u>	
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA  Facsimile No. 06 2853929	Authorized officer <i>Adriano Giacobetti</i> A GIACOBETTI  Telephone No. (06) 2832541	



C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
A	AU,A, 53253/90 (633895) (THE MEAT INDUSTRY RESEARCH INSTITUTE OF NEW ZEALAND INCORPORATED) 18 October 1990 (18.10.90) page 3, paragraph 3-page 4, paragraph 1; page 4, paragraph 4-page 5, paragraph 1, page 10, paragraph 2	1, 5, 11
A	EP,A1, 159826 (ERNEST A BITTERLING LIMITED) 30 October 1985 (30.10.85) page 1, line 19-page 2, line 6	1, 5

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/NZ 94/00015**

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	86748/91	NZ	235820		
AU	53253/90	CA	2014688	EP	392874
		US	5192242	NZ	228761
AU	36232/84	NZ	204450		
EP	159826	DK	1390/85	GB	8407997
<b>END OF ANNEX</b>					