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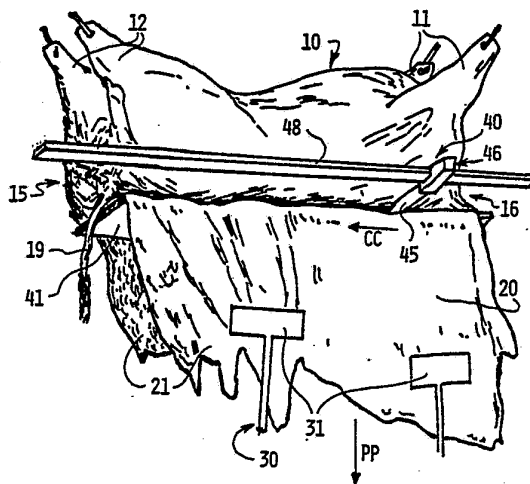
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(54) Title: ANIMAL HIDE REMOVAL



(57) Abstract

A process and apparatus for removing a hide (20) from an animal carcass (10). The animal carcass is initially opened to provide an edge (21) of the hide and the edge is pulled in a direction (PP) transverse to the longitudinal direction (LL) so as to separate the hide progressively from the carcass until a strip of hide (25) remains attached along the spine. The strip of hide (25) is then cleared by moving a clearing means (40) along between the carcass and the strip of hide. During both hide pulling and clearing, the carcass (10) is supported in the supine position with the anterior end (16) of the carcass lower than the posterior end (15). During pulling, the line of dislocation (16) of the hide from the carcass is maintained substantially parallel to the longitudinal direction (LL). The direction (PP) of application of the pulling force is maintained so that the hide (20) is essentially peeling back upon itself away from the subcutaneous tissues of the carcass. Tension is applied to the hide in the longitudinal direction (LL) after the step of hide pulling and before commencement of the longitudinal clearing step. The hide (20) is pulled from the head (14) at the end of the step of clearing the strip of hide (25).

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ANIMAL HIDE REMOVAL

This invention relates to a process and apparatus for removing the hide from an animal carcass.

The removal of the hide from an animal carcass by pulling the hide is, in general terms, a known process. During an initial dressing stage after the animal has been slaughtered, various preliminary operations are manually carried out on the carcass. These preliminary preparations carried out on the carcass may comprise the following:

1. The foreleg and rear leg hocks are removed and the pizzle or udders removed.
2. The hide is cleared from the inside portion of the two rear legs down to the navel, exposing the flank and clearing the outside of each leg over the roll of the silverside, and along to the gam string.
3. The hide is cleared from the navel to the stick wound, clearing the neck hide sufficiently to clear the conical muscle.
4. The inside of both forelegs and each side of the brisket are cleared. The outsides of the forelegs are cleared over the shoulder, exposing the top edge of the rosette.
5. The flanks are dressed down until they are above the edge of the rosette.
6. The muzzle is removed and the ears are cleared.
7. The rectum is separated from the hide by separating the anal sphincter muscles. The rectum is then sealed.

Although not all of these steps are always carried out, and sometimes there are additional preliminary preparations, these preparations listed are typical for an automated or mechanical hide removal system.

In Australian patent specification No. 29,199/89, and in the equivalent US Patent No. 5,062,820, there is described in relation to Figs. 4 and 5 of the drawings of that specification, a hide pulling system in which clamps engage edges of the hide which have been cut free from the belly in the preliminary dressing operations. The hide is pulled downwardly and then the pulling angle is progressively changed so that hide is pulled from the forequarter back towards the hindquarter of the carcass. This process and apparatus, and other

similar processes which utilise pulling the hide outwardly away from or along the carcass, damages the carcass and may also leave valuable meat and/or fat portions attached to the hide with consequent loss of saleable mass of the carcass and the need for additional processing of the hide to remove such matter. The damage can be caused by pulling the fat away from the carcass, e.g. from the loin flank, hip and rump areas. Also the muscle tissue immediately beneath the hide, particularly the cutaneous trunci, also known as the "red-bark", can be torn.

It is an object of the present invention to provide a useful alternative process and apparatus for removing hide from a carcass which is susceptible to automation or mechanisation of the operation.

It is a preferred object of the present invention to provide a new process and apparatus for removing hide from a carcass which can enable an acceptable quality or "finish" on the carcass after the hide has been removed.

According to the present invention there is provided a process for removing a hide from an animal carcass, the carcass having a longitudinal direction being along or parallel to the general line of the spine of the animal carcass, the animal carcass initially having an opening in the hide to provide an edge of the hide, the process being characterised by the steps of: pulling the edge of the hide in a direction transverse to the longitudinal direction so as to separate the hide progressively from the carcass, the pulling of the hide in the transverse direction being carried out until a strip of hide remains attached to and extends along the carcass generally in the longitudinal direction; and, subsequent to the hide pulling step: longitudinally clearing the strip of hide by moving a clearing means along between the carcass and the strip of hide so as to clear the strip from the carcass.

The transverse direction in which the hide is pulled is preferably at an angle of between 70° and 110° to the longitudinal direction. Preferably the transverse direction does not intersect the longitudinal line of the spine.

A preliminary dressing operation is preferably carried out to open and clear the hide ventrally along the length of the carcass so as to produce edges of the hide, the hide pulling step comprising

engaging the edges of the hide followed by the application of pulling forces applied to the hide edges in the transverse direction.

Preferably the carcass is supported in the supine position with the legs of the animal extending upwardly, the spine of the carcass being inclined to the horizontal with the anterior end of the carcass lower than the posterior end of the carcass.

The step of pulling the hide may be carried out so that the line of dislocation of the hide from the carcass is maintained substantially parallel to the longitudinal direction, the line of dislocation being defined as the line along which separation of the hide from the carcass is occurring during the hide pulling step. Preferably the spine of the carcass is supported during the hide pulling step and the hide is pulled simultaneously at both sides of the carcass.

The hide, as it is being pulled in the transverse direction from the carcass, defines in a plane generally orthogonal to the longitudinal direction an angle of dislocation being the angle defined between a line being formed by the hide as it is being pulled from the carcass and a tangent to the carcass at the point of separation of the hide from the carcass, this angle of dislocation preferably being maintained at a relatively small value throughout the step of pulling of the hide. The angle of dislocation preferably is maintained less than 90° throughout the pulling of the hide. The angle of dislocation when the hide is being pulled from the flanks of the carcass is preferably less than 15° . The angle of dislocation may be maintained at a relatively small value by changing the direction of the line being formed by the hide as it is pulled away from the carcass by changing the direction of the pulling force as the step of pulling the hide progresses.

The transverse direction, being the direction of application of the pulling force, is preferably maintained so that the hide during the pulling step is essentially peeling back upon itself away from the subcutaneous tissues of the carcass so as to minimise damage to the subcutaneous tissues.

Preferably the strip of hide is located along the spine of the carcass and on both lateral sides of the spine.

Preferably the carcass is stretched in the longitudinal direction before and during the step of pulling the hide so as to apply tension to the tissues of the carcass.

When the carcass is in the supine position and is suspended by the legs, the stretching of the carcass may be achieved by separating the fore legs and hind legs to apply a predetermined tension.

The strip of hide has an outside surface which is preferably supported by a support surface during the clearing step so as to lie along a known contour, the clearing means being moved along that known contour and parallel to the support surface so as to clear the strip of hide from the carcass.

The direction of movement of the clearing means is preferably from the anterior end of the carcass towards the posterior end, the movement of the clearing means being preceded by a step of inserting the clearing means into its initial starting position at the region of the scapula of the carcass.

The process may include a further step of applying tension to the hide in the longitudinal direction after the step of hide pulling and before commencement of the longitudinal clearing step. The step of applying tension may comprise applying a tensile force to the hide towards the end of the carcass where the longitudinal clearing movement begins and in a direction opposite to the direction of movement of the clearing means.

During the clearing step, the spine of the carcass may be supported at a shallow acute angle to the horizontal with the anterior end of the carcass lower than the posterior end and a tensile force is applied to the hide in a downward and forward direction with respect to the carcass spine as the clearing means is moved in a direction from the anterior end and towards the posterior end to clear the strip of hide from the carcass.

The process may also include a further step of pulling the hide from the head of the carcass at the end of the step of clearing the strip of hide, the hide being pulled from the head by application of pulling force to the hide in a direction at an angle of between 30° and 60° to the longitudinal direction so as to pull the hide over the head. The force applied to the hide to pull the hide from the head may be generally in the longitudinal direction but the point of application of the force may be spaced from the spine so that the

line of force through the hide forms an angle of about 45° to the general longitudinal line of the spine.

The present invention also provides an apparatus for removing a hide from an animal carcass, the carcass having a longitudinal direction being along or parallel to the general line of the spine of the animal carcass, the animal carcass initially having an opening in the hide to provide an edge of the hide, the apparatus being characterised by: pulling means for pulling the edge of the hide in a direction transverse to the longitudinal direction so as to separate the hide progressively from the carcass, the pulling of the hide in the transverse direction being carried out until a strip of hide remains attached to and extends along the carcass generally in the longitudinal direction; and clearing means operable, after operation of the pulling means, to be inserted between the carcass and the strip of hide and to longitudinally clear the strip of hide by moving in the longitudinal direction between the carcass and the strip of hide so as to clear the strip from the carcass.

The apparatus may further include a support member for contacting and supporting the carcass along the spine during the operation of the pulling means.

In the preferred embodiment in which the carcass is supported in the supine position with the legs of the animal extending upwardly, the pulling means may include clamps which are applied to the edge of the hide and means for drawing the clamps in a downward direction. When viewed in the longitudinal direction, the direction of movement of the clamps preferably is generally vertical when the hide is being pulled from the flanks of the carcass, the direction of movement of the clamps being subsequently changed so as to be angled towards a line parallel to and below the line of the spine so as to produce at the point where the hide is separating from the carcass a smaller angle between the hide that is being pulled and a tangent to the carcass as the hide is pulled from the carcass closer to the spine than would be produced by the vertical pulling direction.

The apparatus may further include a strip supporting means for contacting and supporting the outside surface of the strip of hide along a known contour during the longitudinal movement of the clearing means.

The clearing means may comprise a clearing tool having a leading edge which, as the tool is advanced along between the carcass and the hide, clears the strip of hide from the adjacent subcutaneous tissues. The clearing tool may comprise a clearing bar which is
5 inserted laterally so as to be initially located between the subcutaneous tissues and the inside surface of the hide. The clearing tool is preferably tilted before commencement of movement of the tool along the strip of hide and is maintained tilted so that the leading edge is at a shallow angle to the inside surface of the hide
10 thereby assisting the leading edge to travel along the hide without piercing either the hide or the subcutaneous tissues which remain attached to the carcass.

The apparatus preferably further includes clearing tool support means arranged to support the clearing tool on both sides of the
15 carcass when it is moving longitudinally to clear the strip of hide and prevent the leading edge moving away from the inside surface of the strip of hide.

A tensioning tool may be inserted in the lateral direction between the hide and the subcutaneous tissue at the same time as the
20 insertion of the clearing tool, the tensioning tool being moved in contact with the strip of hide in the direction opposite to the clearing direction and before commencement of the longitudinal clearing movement so as to thereby apply a stretching or tensile force to the strip of hide, thereby assisting advancement of the
25 clearing tool without bunching or gathering of the strip of hide in front of the advancing leading edge of the clearing tool and inhibiting piercing of the hide or subcutaneous tissues by the leading edge of the clearing tool.

Possible and preferred features of the present invention will
30 now be described with particular reference to the accompanying drawings. However it is to be understood that the features illustrated in and described with reference to the drawings are not to be construed as limiting on the scope of the invention. In the drawings:

35 Fig. 1 shows a side view of a beef carcass after preliminary dressing operations prior to commencement of the process of the invention,

Fig. 2 shows schematically a carcass suspended and prestretched as a first stage in the process of the invention,

Fig. 3 is a schematic side view showing the transverse hide pulling step,

5 Figs 4 and 5 show a support plate in its folded position and in use for the hide pulling step,

Fig. 6 and 7 show a support plate in its unfolded position and in use for the longitudinal clearing step,

10 Fig. 8 shows an underneath perspective view of a carcass at the start of the longitudinal clearing step,

Fig. 9 shows a possible arrangement of clearing tool and tensioning tool for use in the longitudinal clearing step,

Fig. 10 illustrates the removal of the hide over the head,

15 Fig. 11 shows a schematic arrangement of apparatus for use in the hide pulling stage, and

Fig. 12 shows a schematic arrangement of apparatus separate to the apparatus of Fig. 11 and for use in the longitudinal hide clearing stage.

20 The automated hide removal process begins immediately after manual hide workup, bunging, pocketing the silverside, marking the tail along both sides, removing the tail brush, and head preparation are completed giving a carcass 10 worked up to the stage shown in Fig. 1.

25 The carcass 10 is suspended by the legs 11, 12 from an overhead conveyor 13 with the head 14 down, i.e. lower than the posterior end 15 and the spine at an angle of about 30° to the horizontal during this manual preparation. The carcass 10 is then conveyed to the hide pull station where the first stage of the process begins.

30 The automated hide removal process may be defined as having three stages:

Stage 1: hide pull,

Stage 2: longitudinal clearing, and

Stage 3: head hide removal.

35 The three stages may be incorporated into the one module or may be carried out by separate apparatus depending upon cycle time requirements of the carcass process line.

Stage 1: hide pull

A 'pre-stretch' is applied to the carcass 10 by means of a tensioning device incorporated into the upper rail of the overhead conveyor 13. This enables longitudinal tensioning of the carcass 10 during the hide pull stage - see Fig. 2 which shows in broken line the tensioned carcass 10a.

The application of tension to the tissues has been found preferable to reduce tearing of the red bark during the pulling process and to reduce disturbance of the subcutaneous fat layer. The longitudinal stretching of the carcass 10 can be achieved in the case of an inverted carcass suspended by the legs 11,12 by separating the suspension means by a predetermined extent e.g. by tensioning device 18 in Fig. 11 arranged to move the support for the fore legs 11 away from the support for the hind legs 12. Stretching of the carcass also assists maintenance of the carcass 10 in a stable position during the hide pulling operation and will assist in maintenance of a line of dislocation 16 (defined later) parallel to the longitudinal direction LL.

After the pre-stretch is applied, four hide clamps 31 extend from individual hydraulic cylinders 33 (two clamps at each side of the carcass) to automatically locate and clamp the hide edges 21. The clamps 31 preferably retract individually after clamping and prior to the hide pull so that each is applying a similar force (e.g. 30kg) immediately prior to the start of the hide pull.

A carcass support means 22 contacts the length of the underside of the carcass 10 approximately 75 mm either side of the spine. This can be before, during or after initial clamping but before start of the hide pull. One important function of this support 22 is to prevent the carcass 10 bowing in the mid sagittal plane during the pull, thus maintaining a hide dislocation line parallel 16 with the spine. Figs. 4 and 5 show a hinged plate as the support 22, and Fig. 11 shows parallel longitudinal support rails 23.

The hide clamps 31 are then retracted in a downward direction PP, perpendicular to the longitudinal direction LL of the spine, in a manner which maintains a low angle of dislocation θ - see Fig 5. The pulling force is preferably greater than about 3kN per clamp. The hide 20 is pulled down, at a speed preferably less than or equal to 0.05 metres/second, to a pre-determined level, at which point the

clamps rise to release tension from the hide. The predetermined level to which the hide is pulled is preferably the line of the support means 22. Pulling of the hide to this level may be ensured by sensing the hide pulling forces being applied by the clamps 31 and, when the forces from individual hide clamps 31 exceed a predetermined value, the application of force at that individual clamp 31 can be discontinued. A strip of the hide 25 approximately 400 to 500 mm wide is left attached along the back of the carcass 10. The direction PP in which the hide 20 is pulled away from the carcass is transverse to the longitudinal direction LL at a relatively large angle, e.g. between 70° and 110°. The direction PP does not intersect the longitudinal line of the carcass spine.

The preliminary dressing operations provide edges 21 of the hide by clearing the hide 20 ventrally along the length of the carcass 10. These edges 21 are clamped for application of the hide pulling forces.

The carcass 10 is suspended by the shackled legs 11,12 from an overhead conveyor 13 and the spine may be either generally horizontal or if desired may be inclined to the horizontal at an acute angle, either head up or, more preferably head down, e.g. at 5° to 20°, preferably 10°, to the horizontal.

As the hide 20 is pulled and separates from the carcass 10, the line 16 along which separation of the hide occurs will be referred to as a "line of dislocation". The pulling step is carried out so that the line of dislocation 16 is substantially parallel to the longitudinal direction LL. This is preferable to minimise damage to the cutaneous trunci which has been found to occur if there is a significant component of the pulling direction in the longitudinal direction LL. To achieve this maintenance of the line of dislocation 16 parallel to the longitudinal direction LL, the hide 20 is pulled simultaneously at both sides of the carcass and also the carcass is supported dorsally, preferably along the spine by the support means 22.

As shown in Fig. 5 the hide 20 as it is being pulled from the carcass 10 defines in a plane generally transverse to the longitudinal direction LL an angle θ between the line being formed by the hide 20 as it is pulled away from the carcass and a tangent 17 to the carcass at the dislocation line 16. This angle θ will be called

the "angle of dislocation". Preferably the angle of dislocation θ is maintained at a relatively small value throughout the pulling of the hide. Maintenance of this angle θ less than 90° throughout the pulling of the hide 20 is desirable and most preferably the angle of dislocation θ is as small as possible. With the carcass 10 supported with the spine generally horizontal and the pull direction PP vertically downwardly, the angle of dislocation θ when the line of dislocation 16 is along the flanks of the carcass 10 will be relatively small, e.g. less than 10° to 15° .

As the line of dislocation 16 progresses down the carcass 10, i.e. towards the spine of the inverted animal, the angle of dislocation θ will increase if the force continues to be applied in the same direction through the hide, e.g. vertically. If desired, the direction from which the pulling force is applied may be varied so as to maintain the angle of dislocation θ as small as possible. For example, the clamps 31 applied to the hide edges 21 may be initially drawn vertically downwardly, but as the dislocation line 16 moves down, the direction of application of force by the clamps may be angled towards a line parallel to and below the spine so as to produce a smaller angle of dislocation θ than would be produced by continued vertical force direction. At small values of the angle of dislocation θ , the hide 20 is effectively peeling back upon itself from the subcutaneous tissues and this peeling action has been found desirable to minimise damage to the subcutaneous fat and cutaneous trunci, i.e. the fascia of the carcass.

Stage 2: longitudinal clearing

At the second stage of the process, the support plate 22 in the embodiment of Figs. 4 to 7 folds out from its previous width of approximately 150 mm to form a flat plate having an upper support surface 41 approximately 600 mm wide. In Fig. 12, the support surface 41 is a separate member. The support surface 41 contacts and supports the full length of the carcass 10, along the spine.

The clamps 31 at the rear of the carcass 10 disengage from the hide 20 and retract whilst the front clamps remain engaged and are used to tension the hide 20 across the front of the surface 41. The outer longitudinal edges of the surface 41 may be radiused to reduce any possible damage to the hide 20 where it passes over those edges.

A clearing means 40 comprising a clearing bar 45, incorporating a longitudinal tensioning device 50, is then inserted laterally between the hide 20 and the carcass 10 below the carcass scapula - see Fig. 8 where the clearing bar 45 is shown schematically only.

5 The point of insertion may be automatically determined by inserting the clearing bar 45 at a predetermined proportion (e.g. 70%) of the distance from the rump to brisket which has been pre-measured and input to a control system. This enables processing of different sizes of carcasses.

10 The clearing bar 45 in Fig. 9 is bevelled and has a leading edge 43 with a radius of 0.2 mm, which extends along its length and around the nose 46 of the bar. The radius along the clearing edge 43 is to prevent any cutting of the hide 20, while the bevel 47 is to keep the bar 45 between the carcass fat and the hide 20. Clearing
15 bar support means 46 supports the bar 45 at both sides of the carcass 10 to prevent the bar 45 lifting off the inside surface of the strip of hide 25.

 The tension bar 50 then traverses in the direction TT towards the head 14 of the carcass 10, stopping when a preset tension is
20 achieved. Alternatively, in Fig. 12, hide clamps 50,51 can apply tension to the hide in directions TT which have a longitudinal component so as to apply tension to the hide 20. The longitudinal tension is maintained while the clearing bar 45 then is driven along
25 guide rail 48 so as to traverse the length of the carcass 10 from the anterior end 16 to the posterior end 15 of the carcass thereby clearing the strip of hide 25 from the carcass 10. The speed of travel is preferably 0.1 to 0.2 metres per second.

 The clearing tool 42 may be tilted before movement along the strip of hide 25 so that the leading edge 43 is at a shallow angle to
30 the inside surface of the hide and this assists the leading edge 43 to travel along the hide without piercing either the hide or the subcutaneous tissues which remain attached to the carcass. The weight of the carcass 10 will assist pressing of the leading edge 43 against the hide inside surface.

35 The application of a stretching or tensile force to the strip of hide 25 in direction TT assists advancement of the clearing tool 42 without bunching or gathering of the strip of hide 25 in front of

the advancing leading edge 43 of the clearing tool 42 and inhibits piercing of the hide or subcutaneous tissues by the leading edge 43 of the clearing tool 42.

To further reduce, or as an alternative means to reduce, bunching of the hide during the clearing tool advance, the spine of the carcass 10 may be inclined at, say, 20° to the horizontal with the head down and the near hide clamps may be removed. Hide tension continues to be applied by the front clamps. This produces tension in a downward and forward direction with respect to the carcass spine. This reduces bunching of the hide in front of the leading edge 43 of the advancing clearing tool 42.

The clearing bar 45 completes its travel at a predefined point immediately prior to reaching the tail 19. The clearing bar 45 is then locked to the support surface 41, creating a clamping point on the hide. The front hide clamps disengage from the hide 20 and retract while simultaneously the support surface 41 and clearing bar 45 assembly are powered in a downward direction away from the carcass 10 (or alternatively the carcass 10 is lifted). The clamping point of the hide between the clearing bar 45 and support surface 41 allows the hide 20 to be stripped from the tail 19 as the assembly is lowered. The hide 20 is left attached to the carcass 10 on the narrow strip from the scapula to the head 14 and the head itself.

Immediately after the hide 20 is stripped from the tail 19, the clearing bar 45 and the longitudinal tensioning device 50 reconverge and retract for sterilising. The support surface 41 is then retracted to the start position.

Stage 3: head hide removal

The final step involves pulling the hide 20 from the head 14 of the carcass 10 (see Fig. 10). The direction HH of the pulling force applied to the hide to pull it from the head is such that the angle of separation $\emptyset$ is substantially more than 0° and substantially less than 90°, e.g. between the angles of 30° and 60°, to the longitudinal direction LL. The force applied to the hide 20 through the clamping means 55 is generally in the longitudinal direction but at a point on the hide spaced from the spine so that the direction HH of force through the hide forms the angle of separation $\emptyset$ of about 45°.

After the hide 20 is removed from the head 14, the clamps 55 disengage from the hide, allowing it to drop onto a hide conveyor for removal.

5 It has been found that the preferred process and apparatus for animal hide removal as herein described and illustrated enables an acceptable quality or finish on the carcass to be achieved following automated hide removal. The hide removal process and apparatus particularly described provide a significantly improved quality or finish to carcass compared to prior automated pulling systems.

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CLAIMS

1. A process for removing a hide (20) from an animal carcass (10), the carcass having a longitudinal direction (LL) being along or parallel to the general line of the spine of the animal carcass (10),
5 the animal carcass initially having an opening in the hide to provide an edge (21) of the hide (20), the process being characterised by the steps of:

pulling the edge (21) of the hide (20) in a direction (PP) transverse to the longitudinal direction (LL) so as to separate the
10 hide (21) progressively from the carcass, the pulling of the hide in the transverse direction (PP) being carried out until a strip of hide (25) remains attached to and extends along the carcass (10) generally in the longitudinal direction (LL); and, subsequent to the hide pulling step:

15 longitudinally clearing the strip of hide (25) by moving a clearing means (40) along between the carcass (10) and the strip of hide (25) so as to clear the strip (25) from the carcass.

2. A process as claimed in Claim 1 characterised in that the transverse direction (PP) in which the hide (20) is pulled is at an
20 angle of between 70° and 110° to the longitudinal direction (LL).

3. A process as claimed in Claim 1 or 2 characterised in that the transverse direction (PP) does not intersect the longitudinal line of the spine.

4. A process as claimed in any one of the preceding claims
25 characterised in that a preliminary dressing operation is carried out to open and clear the hide (20) ventrally along the length of the carcass (10) so as to produce edges (21) of the hide, the hide pulling step comprising engaging the edges (21) of the hide followed by the application of pulling forces applied to the hide edges (21)
30 in the transverse direction (PP).

5. A process as claimed in any one of the preceding claims characterised in that the carcass (10) is supported in the supine position with the legs (11,12) of the animal extending upwardly, the spine of the carcass (10) being inclined to the horizontal with the
35 anterior end (16) of the carcass (10) lower than the posterior end (15) of the carcass.

6. A process as claimed in any one of the preceding claims characterised in that the step of pulling the hide (20) is carried

out so that the line of dislocation (16) of the hide from the carcass is maintained substantially parallel to the longitudinal direction (LL), the line of dislocation (16) being defined as the line along which separation of the hide (20) from the carcass (10) is occurring during the hide pulling step.

7. A process as claimed in Claim 6 characterised in that the spine of the carcass (10) is supported during the hide pulling step and the hide (20) is pulled simultaneously at both sides of the carcass.

8. A process as claimed in any one of the preceding claims characterised in that the hide (20), as it is being pulled in the transverse direction (PP) from the carcass (10), defines in a plane generally orthogonal to the longitudinal direction (LL) an angle of dislocation (θ) being the angle defined between a line being formed by the hide (20) as it is being pulled from the carcass and a tangent (17) to the carcass (10) at the point of separation of the hide from the carcass, the angle of dislocation (θ) being maintained at a relatively small value throughout the step of pulling of the hide.

9. A process as claimed in Claim 8 characterised in that the angle of dislocation (θ) is maintained less than 90° throughout the pulling of the hide.

10. A process as claimed in Claims 8 or 9 characterised in that the angle of dislocation (θ) when the hide (20) is being pulled from the flanks of the carcass is less than 15° .

11. A process as claimed in Claim 8, 9 or 10 characterised in that the angle of dislocation (θ) is maintained at a relatively small value by changing the direction of the line being formed by the hide (20) as it is pulled away from the carcass (10) by changing the direction of the pulling force as the step of pulling the hide (20) progresses.

12. A process as claimed in any one of the preceding claims characterised in that the transverse direction (PP), being the direction of application of the pulling force, is maintained so that the hide (20) during the pulling step is essentially peeling back upon itself away from the subcutaneous tissues of the carcass (10) so as to minimise damage to the subcutaneous tissues.

13. A process as claimed in any one of the preceding claims characterised in that the strip of hide (25) is located along the spine of the carcass (10) and on both lateral sides of the spine.

14. A process as claimed in any one of the preceding claims characterised in that the carcass (10) is stretched in the longitudinal direction (LL) before and during the step of pulling the hide (20) so as to apply tension to the tissues of the carcass.
- 5 15. A process as claimed in Claim 14 characterised in that the carcass (10) is in the supine position and is suspended by the legs (11,12), the stretching of the carcass (10) being achieved by separating the fore (11) legs and hind legs to (12) apply a predetermined tension.
- 10 16. A process as claimed in any one of the preceding claims characterised in that the strip of hide (25) has an outside surface which is supported by a support surface (41) during the clearing step so as to lie along a known contour, the clearing means (40) being moved along that known contour and parallel to the support surface
- 15 (41) so as to clear the strip of hide (25) from the carcass (10).
17. A process as claimed in any one of the preceding claims characterised in that the direction of movement (CC) of the clearing means (40) is from the anterior end (16) of the carcass (10) towards the posterior end (15), the movement of the clearing means (40) being
- 20 preceded by a step of inserting the clearing means (40) into its initial starting position at the region of the scapula of the carcass (10).
18. A process as claimed in any one of the preceding claims characterised in that there is a further step of applying tension to
- 25 the hide (20) in the longitudinal direction (LL) after the step of hide pulling and before commencement of the longitudinal clearing step.
19. A process as claimed in Claim 17 characterised in that the step of applying tension comprises applying a tensile force to the hide
- 30 (20) towards the end of the carcass (16) where the longitudinal clearing movement begins and in a direction opposite to the direction of movement (CC) of the clearing means (40).
20. A process as claimed in any one of the preceding claims characterised in that, during the clearing step, the spine of the
- 35 carcass (10) is supported at a shallow acute angle to the horizontal with the anterior end (16) of the carcass lower than the posterior end (15) and a tensile force is applied to the hide in a downward and forward direction (TT) with respect to the carcass spine as the

clearing means (40) is moved in a direction (CC) from the anterior end (16) and towards the posterior end (15) to clear the strip of hide (25) from the carcass (10).

21. A process as claimed in any one of the preceding claims
5 characterised in that there is a further step of pulling the hide (20) from the head (14) of the carcass at the end of the step of clearing the strip of hide, the hide (20) being pulled from the head (14) by application of pulling force to the hide (20) in a direction (HH) at an angle ($\emptyset$) of between 30° and 60° to the longitudinal
10 direction (LL) so as to pull the hide (20) over the head (14).

22. A process as claimed in Claim 21 characterised in that the force applied to the hide (20) to pull the hide from the head (14) is generally in the longitudinal direction (LL) but the point (42) of application of the force is spaced from the spine so that the line of
15 force (HH) through the hide (20) forms an angle ($\emptyset$) of about 45° to the general longitudinal line (LL) of the spine.

23. Apparatus for removing a hide (20) from an animal carcass (10), the carcass (10) having a longitudinal direction (LL) being along or parallel to the general line of the spine of the animal carcass, the
20 animal carcass (10) initially having an opening in the hide to provide an edge (21) of the hide (20), the apparatus being characterised by:

pulling means (30) for pulling the edge (21) of the hide in a direction (PP) transverse to the longitudinal direction (LL) so as to
25 separate the hide (20) progressively from the carcass (10), the pulling of the hide in the transverse direction (PP) being carried out until a strip of hide (25) remains attached to and extends along the carcass (10) generally in the longitudinal direction (LL); and

clearing means (40) operable, after operation of the pulling
30 means (30), to be inserted between the carcass (10) and the strip of hide (25) and to longitudinally clear the strip of hide by moving in the longitudinal direction (LL) between the carcass (10) and the strip of hide (25) so as to clear the strip from the carcass.

24. Apparatus as claimed in Claim 23 characterised in that there is
35 further provided a support member (22) for contacting and supporting the carcass (10) along the spine during the operation of the pulling means (30).

25. Apparatus as claimed in Claim 23 or 24 characterised in that carcass (10) is supported in the supine position with the legs (11,12) of the animal extending upwardly and further characterised in that the pulling means (30) includes clamps (31) which are applied to the edge (21) of the hide (20) and means (32) for drawing the clamps (31) in a downward direction (PP).

26. Apparatus as claimed in Claim 25 characterised in that, when viewed in the longitudinal direction (LL), the direction of movement (PP) of the clamps (31) is generally vertical when the hide (20) is being pulled from the flanks of the carcass (10), the direction of movement (PP) of the clamps (31) being subsequently changed so as to be angled towards a line parallel to and below the line of the spine so as to produce at the point where the (20) hide is separating from the carcass (10) a smaller angle (θ) between the hide (20) that is being pulled and a tangent (17) to the carcass (10) as the hide (20) is pulled from the carcass closer to the spine than would be produced by the vertical pulling direction.

27. Apparatus as claimed in any one of Claims 23 to 26 characterised in that there is further provided a strip supporting means (41) for contacting and supporting the outside surface of the strip of hide (25) along a known contour during the longitudinal movement of the clearing means (40).

28. Apparatus as claimed in any one of Claims 23 to 27 characterised in that the clearing means (40) comprises a clearing tool (42) having a leading edge (43) which, as the tool (42) is advanced along between the carcass (10) and the hide (20), clears the strip of hide (25) from the adjacent subcutaneous tissues.

29. Apparatus as claimed in Claim 24 characterised in that the clearing tool (42) comprises a clearing bar (45) which is inserted laterally so as to be initially located between the subcutaneous tissues and the inside surface of the hide (20).

30. Apparatus as claimed in Claim 28 or 29 characterised in that the clearing tool (42) is tilted before commencement of movement of the tool along the strip of hide (25) and is maintained tilted so that the leading edge (43) is at a shallow angle to the inside surface of the hide (40) thereby assisting the leading edge (43) to travel along the hide (20) without piercing either the hide or the subcutaneous tissues which remain attached to the carcass (10).

31. Apparatus as claimed in any one of Claims 28 to 30 characterised in that there is further provided clearing tool support means (46) arranged to support the clearing tool (42) on both sides of the carcass (10) when it is moving in the longitudinal direction (CC) to clear the strip of hide (25) and prevent the leading edge (43) moving away from the inside surface of the strip of hide (25).

32. Apparatus as claimed in any one of the preceding claims characterised in that there is provided a tensioning tool (50) which is inserted in the lateral direction between the hide (20) and the subcutaneous tissue at the same time as the insertion of the clearing tool (42), the tensioning tool (50) being moved in contact with the strip of hide (25) in the direction (TT) opposite to the clearing direction (CC) and before commencement of the longitudinal clearing movement so as to thereby apply a stretching or tensile force to the strip of hide (25), thereby assisting advancement of the clearing tool (42) without bunching or gathering of the strip of hide (25) in front of the advancing leading edge (43) of the clearing tool (42) and inhibiting piercing of the hide (20) or subcutaneous tissues by the leading edge (43) of the clearing tool.

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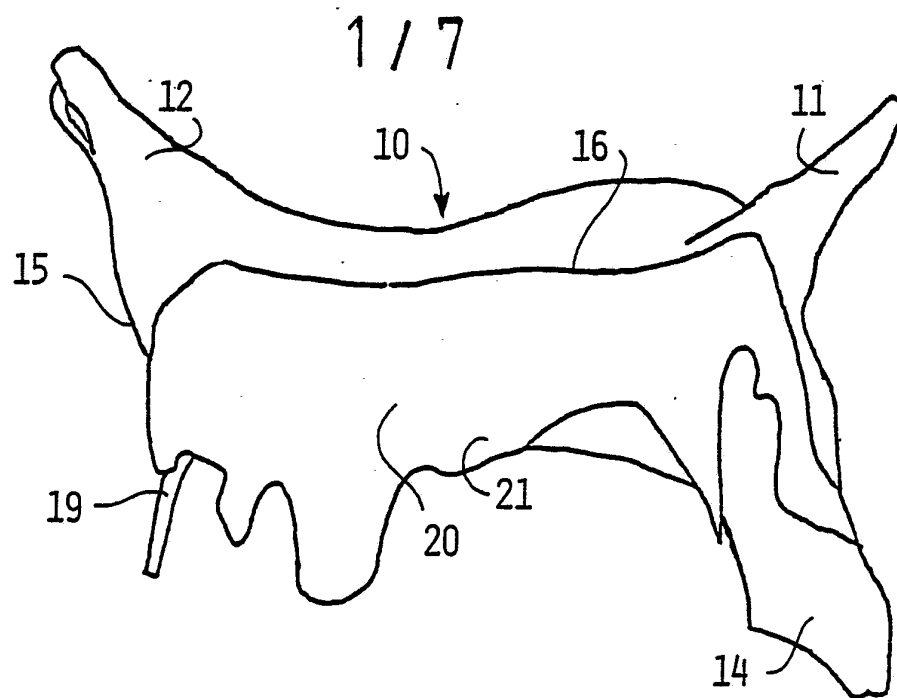


Fig. 1

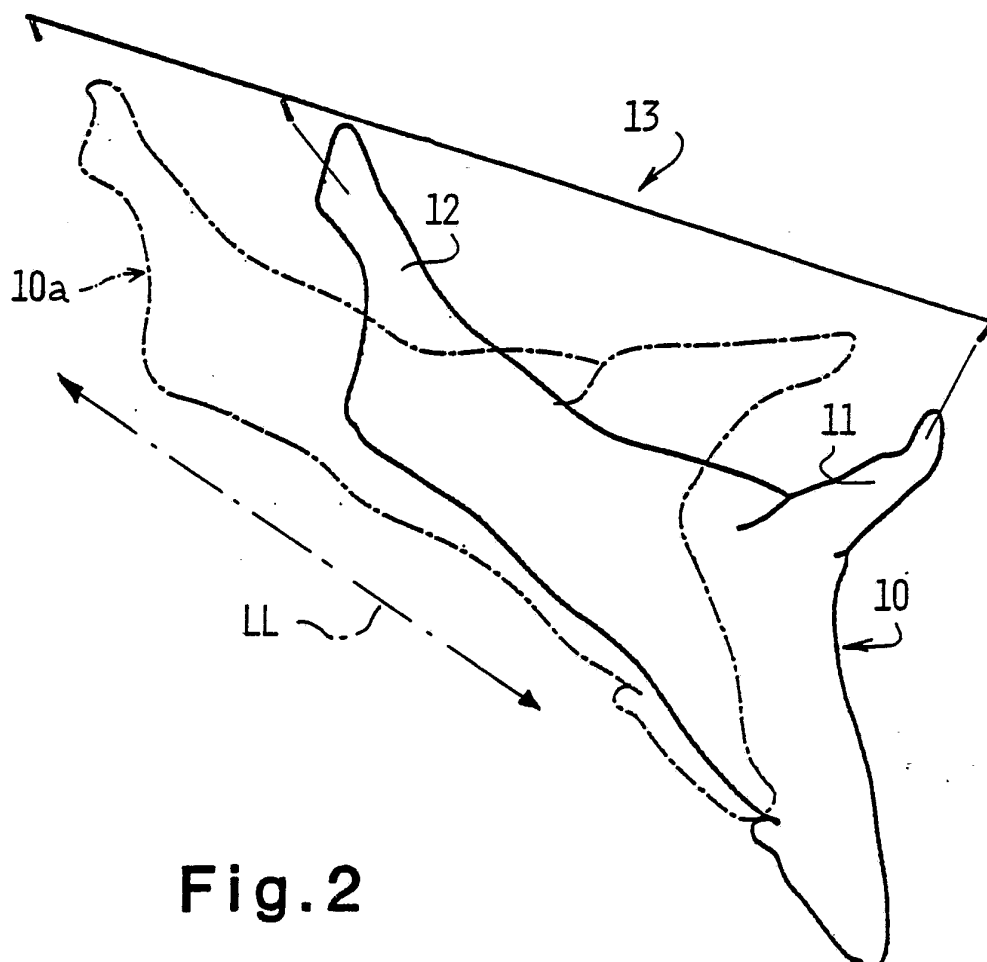


Fig.2

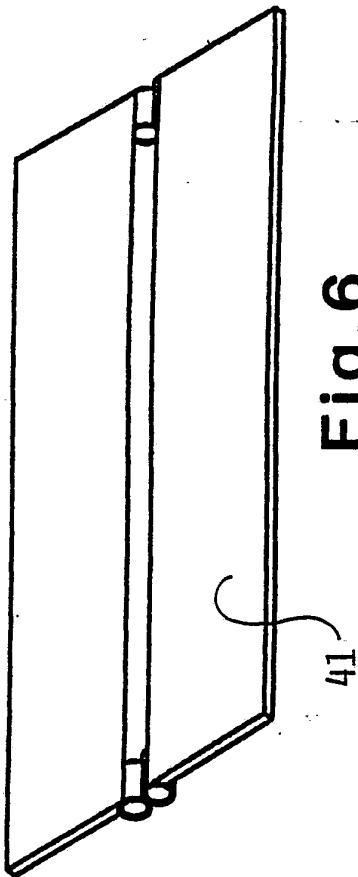


Fig. 6

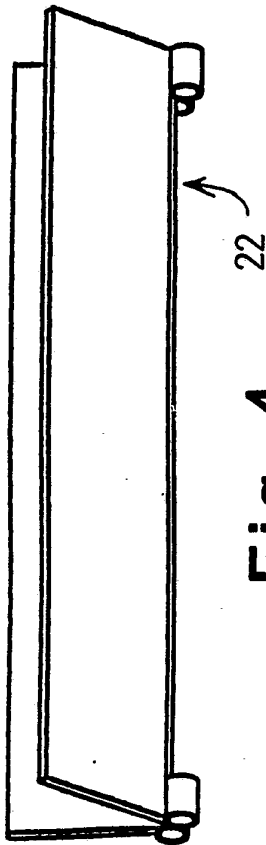


Fig. 4

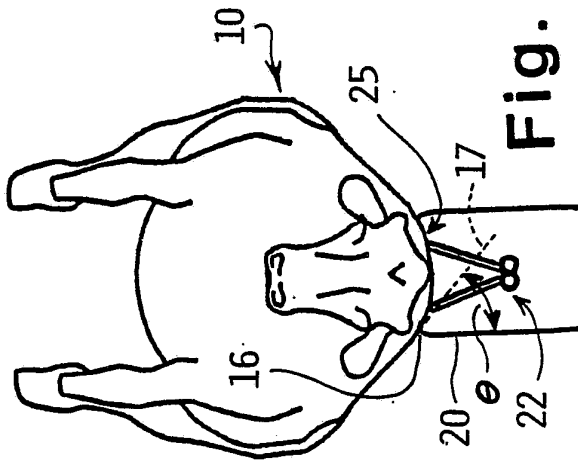


Fig. 5

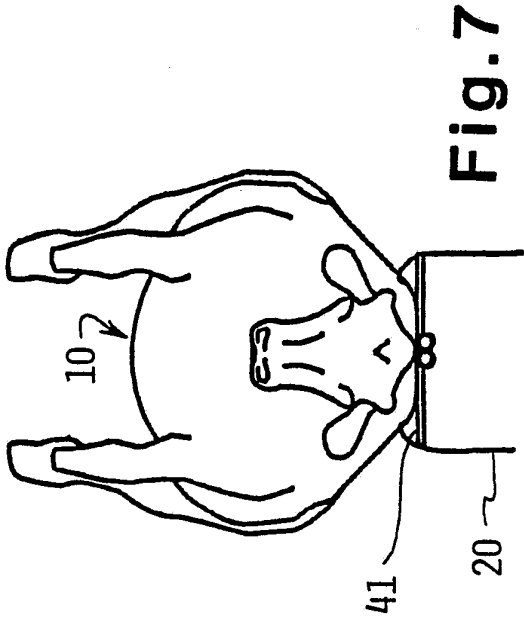


Fig. 7

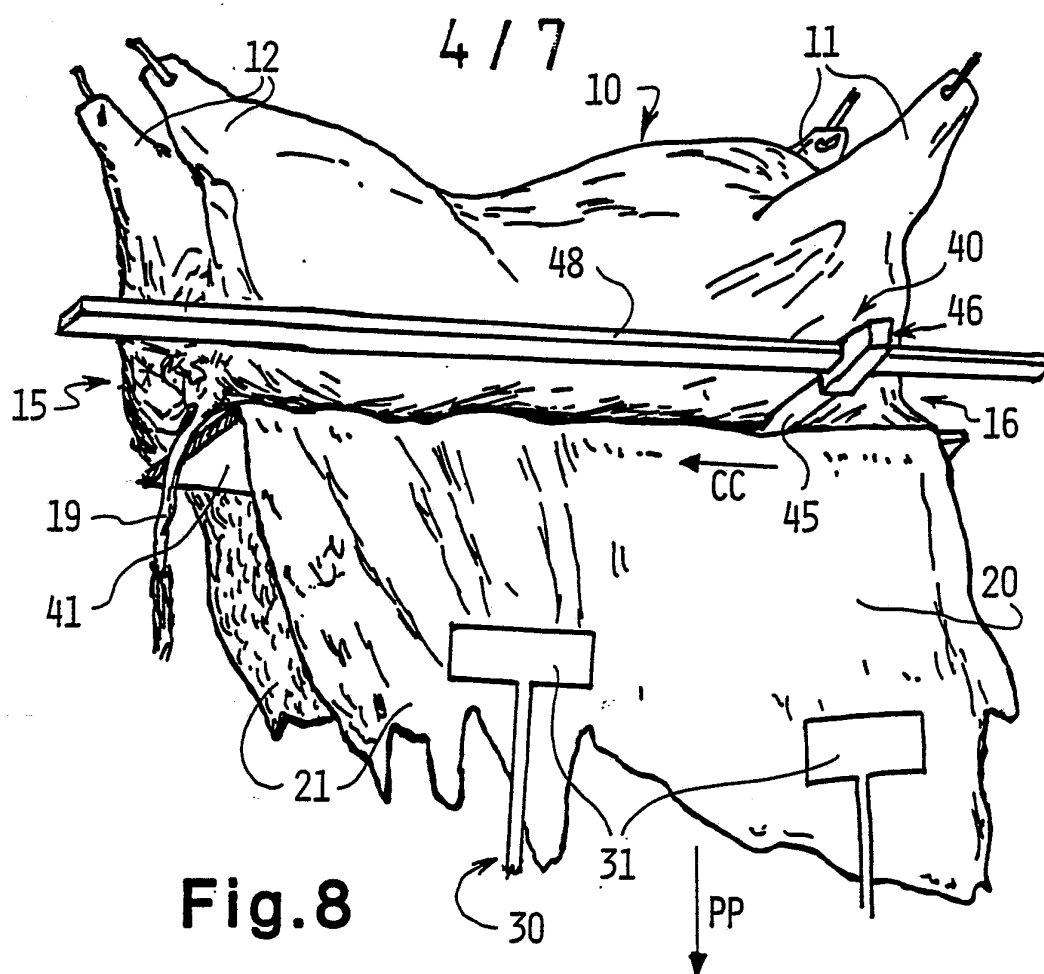


Fig.8

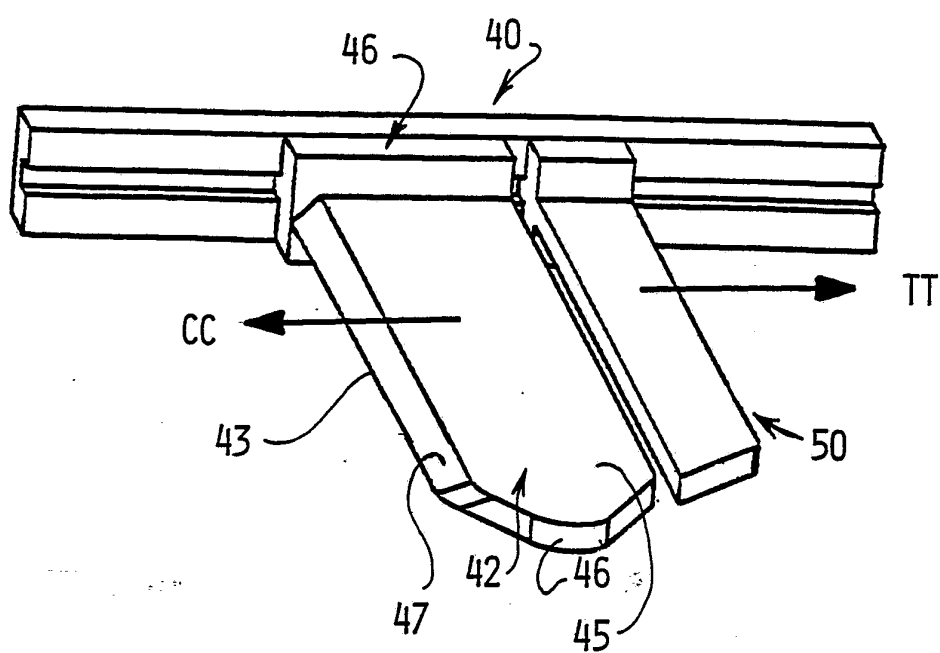
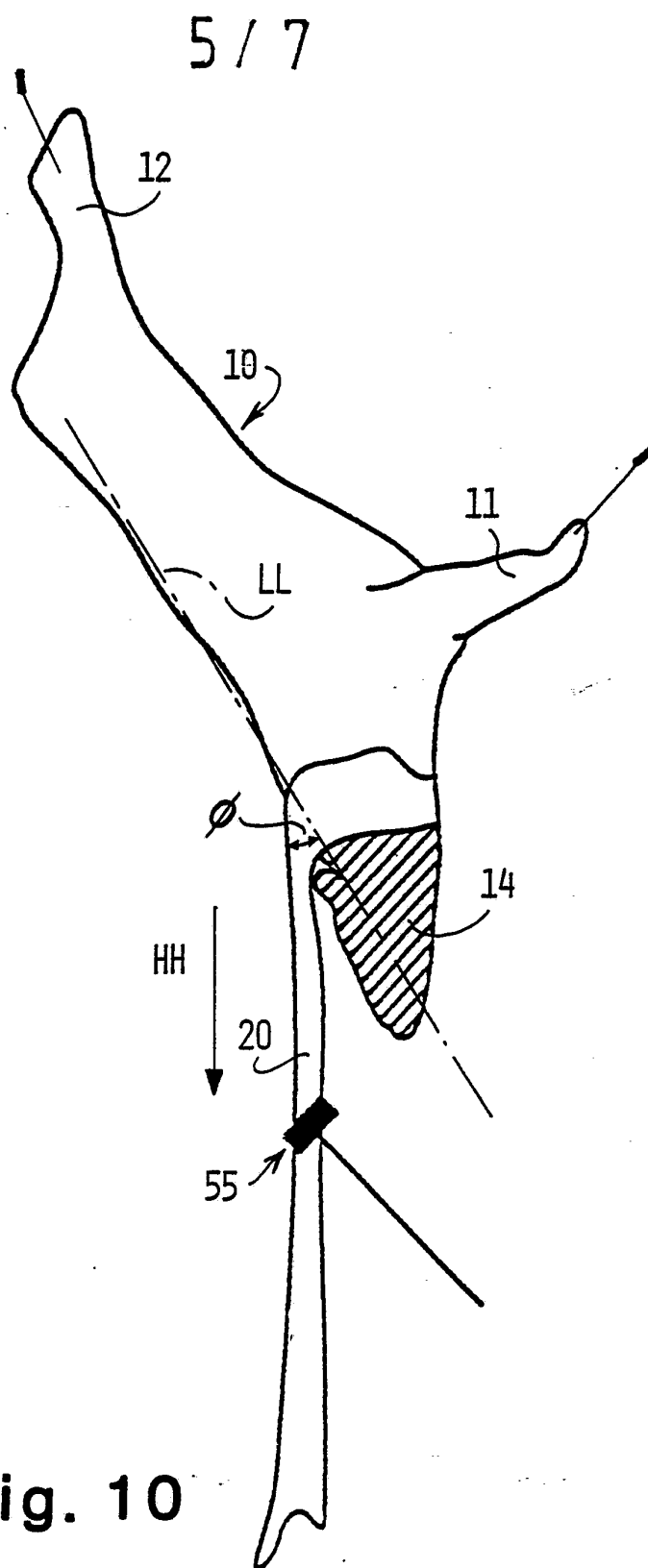


Fig.9



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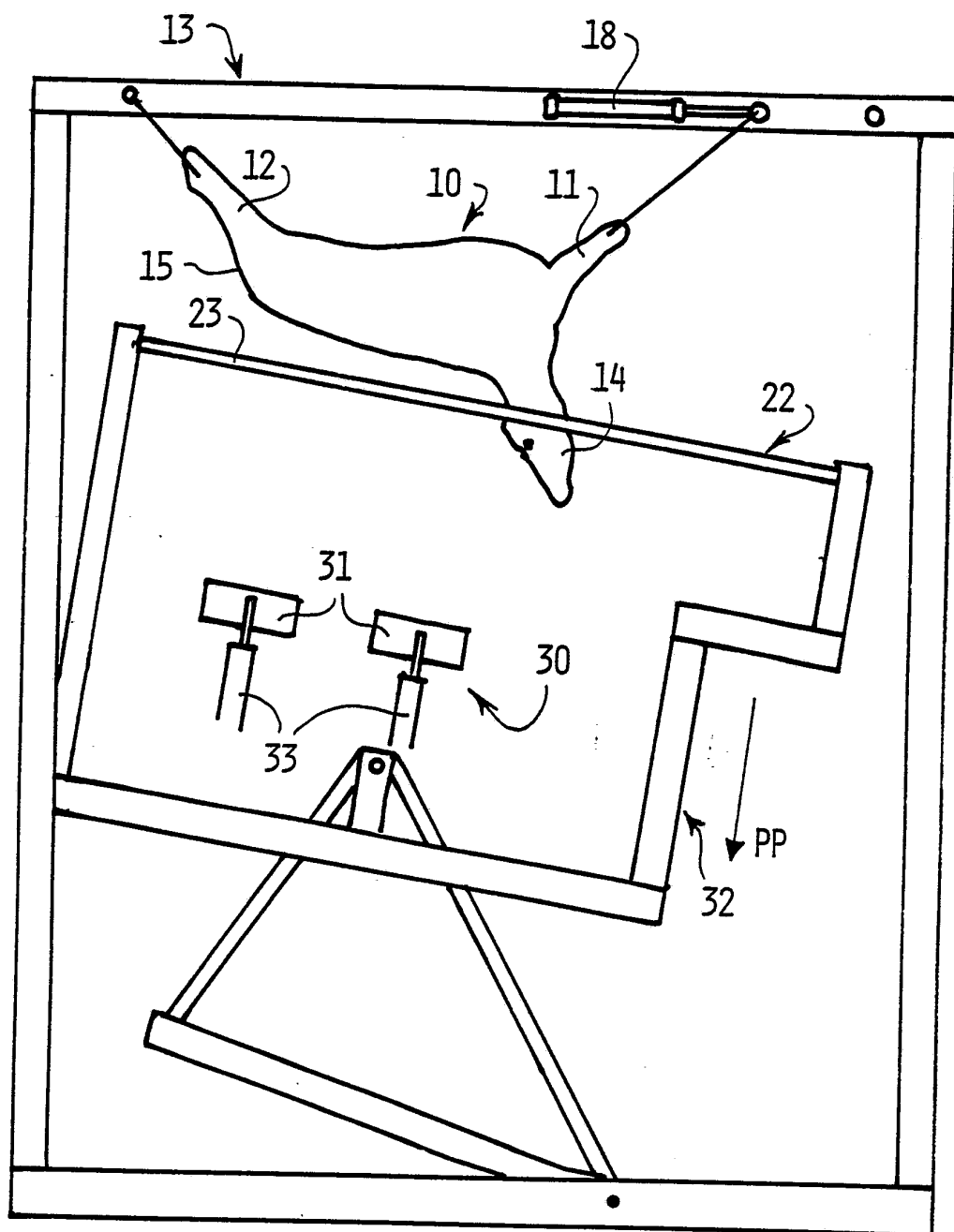


Fig. 11

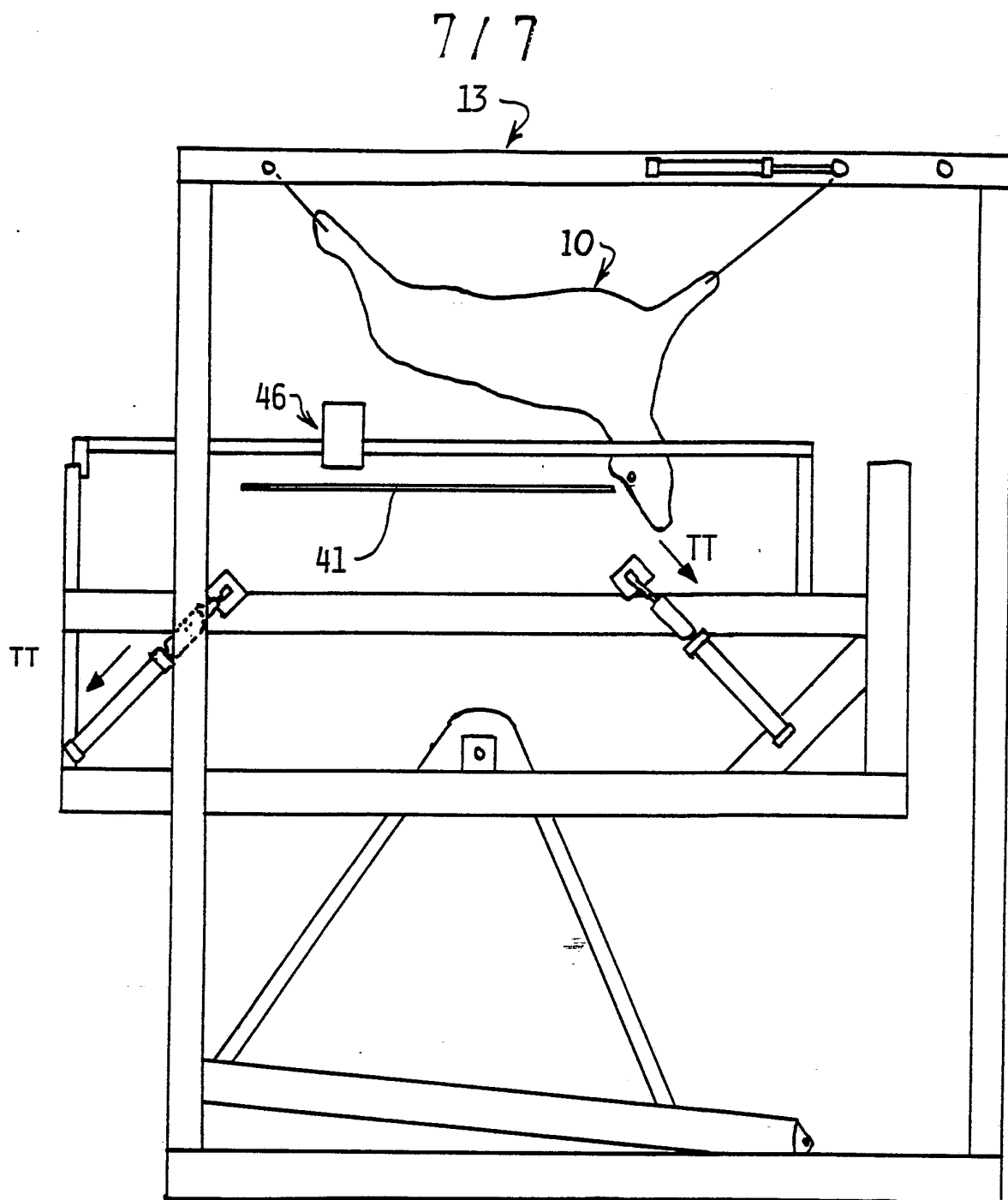


Fig. 12

A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. ⁵ A22B 5/16, 5/06, 5/00 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 5/16, 5/06, 5/00 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC as above 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.			
Y	US,A,2897537 (SCHMIDT) 4 August 1959 (04.08.59) figures 1-3	1,2,4,6-9,12,13,16,17, 19,23,24,27-29			
Y	AU,A,15297/83 (WARREN CHARLES THORNE SLY) 8 December 1983 (08.12.83) figures 1-6	1,2,4,6-9,12,13,16,17, 19,23,24,27-29			
Y	DE,A,667670 (STUDIENGESELLSCHAFT DER DEUTSCHEN LEDERINDUSTRIE GMBH) 20 October 1938 (20.10.38) figure 1	1,2,4,6-9,12,13,16,17, 19,23,24,27-29			
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.					
<table style="width: 100%; border: none;"> <tr> <td style="width: 33%; vertical-align: top;"> * Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 33%; vertical-align: top;"> "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 </td> <td style="width: 33%;"></td> </tr> </table>			* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"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	
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"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 14 July 1993 (14.07.93)		Date of mailing of the international search report 23 JULY 1993 (23.07.93)			
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  G.M. COX Telephone No. (06) 2832484			

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
A	GB,A,784118 (POUPET) 2 October 1957 (02.10.57) figures 2 and 7	1,23
A	DE,A,2159775 (STOHRER) 7 June 1973 (07.06.73) figure 1	1,23
A	DE,A,1287964 (THE CINCINNATIE BUTCHERS SUPPLY COMPANY) 23 January 1969 (23.01.69) figure 1	1,23
A	US,A,3553767 (HERZOG) 12 January 1971 (12.01.71) figure 1	1,23
A	AU,A,84183/82 (RAPH ENGLE SYSTEMS LIMITED) 2 December 1982 (02.12.82) figure 1	1,23
A	AU,14658/62 (251963) (POWELL) 25 June 1964 (25.06.64) figure 1	1,23

PCT/AU93/00125

Patent Document Cited in Search Report		Patent Family Member
AU	15297/83	
AU	84183/82	
DE	2159775	
US	3553767	
END OF ANNEX		