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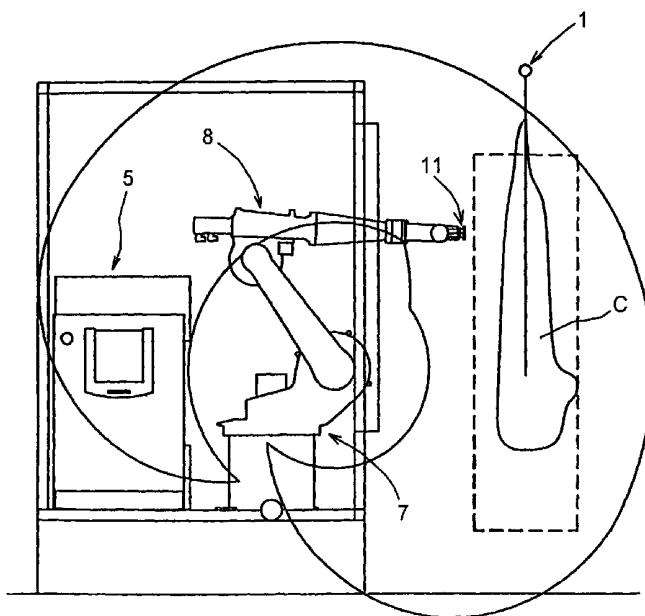
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[Continued on next page]

(54) Title: IMPROVING THE TRACEABILITY OF MEAT



(57) Abstract: The traceability of meat is improved by applying a unique carcass-identification serial number to selected areas of a meat carcass before it is separated into primal cuts. The serial number may be visible or invisible and is applied in a manually readable and an encoded, machine-readable form. An indelible ink which is specified for food applications is applied using a printing head carried and moved by a mechanical robotic arm (8) under the control of a computer while the meatcarcasses (C) move along a carrier system (1) from a loading position to an unloading position. A proximity sensor allows positioning of the head close to the carcass.



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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

IMPROVING THE TRACEABILITY OF MEAT

TECHNICAL FIELD OF THE INVENTION

This invention is concerned with improving the traceability of meat.

BACKGROUND

Traceability is currently one of the most topical issues in the meat industry driven in part by a desire to meet high expectations of retailers and consumers. Full forward and backward traceability from farm to consumer is desirable in order to minimise and control the health risks associated with BSE, e. coli, salmonella etc. Quality related payment has necessitated the implementation of traceability procedures from farm to the point of carcass grading and classification, but to date, traceability beyond this point has been very limited. Although full traceability of some beef products back to the original carcass has been achieved this involves the use of laborious manual documentation procedures.

The present invention seeks to provide a new and inventive method and apparatus for improving the traceability of meat.

SUMMARY OF THE INVENTION

The present invention proposes a method of improving the traceability of meat in which a unique carcass-identification mark is applied to selected areas of a meat carcass before the carcass is separated into primal cuts.

By choosing the appropriate areas depending on the kind of carcass and the nature of the end products it is possible to ensure that every piece of meat carries the mark, thereby unambiguously linking it to the original carcass.

The carcass-identification mark may be visible or invisible and preferably includes a unique serial number. The mark may be applied in a human-readable form but is preferably applied in an encoded, machine-readable form. By this means the mark can automatically be read prior to packaging of the meat products and the mark applied to the packing in a human-readable form.

The carcass-identification mark may be applied to the carcass using a laser or other means, but the mark may cheaply and reliably be applied by means of an indelible ink which is specified for food applications. The ink is preferably applied using a printing head which is carried and moved by a mechanical robotic arm under the control of a computer.

The invention also provides carcass marking apparatus which includes:

- a carrier system for moving prepared meat carcasses from a loading position to an unloading position;
- sensing means for detecting the position of the meat carcasses during movement along the carrier system; and
- a marking head which is carried and moved by a mechanical robotic arm under the control of a computer in response to information provided by the sensing means in order to apply a unique carcass-identification mark to the carcass.

The marking head may be provided with a proximity sensor allowing the positioning of the head close to the carcass. This allows for shape variation between the carcasses, keeping the printing head in the optimum position relative to the carcass for best print quality.

The use of a computer-controlled robotic arm allows the marking head to move quickly and accurately to the required positions relative to the carcass.

The arm will generally be arranged to move the head in three mutually orthogonal axes.

The marking head could, for example, include a laser, but a low cost system may simply apply the mark to the carcass by means of indelible ink. The marks may be applied using invisible ink (except for a health mark which must, by law, be visible) and may be applied to the skin side and/or the bone side of the carcass.

The carrier system preferably includes a series of suspension elements for suspending the carcasses therefrom.

BRIEF DESCRIPTION OF THE DRAWINGS

The following description and the accompanying drawings referred to therein are included by way of non-limiting example in order to illustrate how the invention may be put into practice. In the drawings:

Figure 1 is a plan view of apparatus for printing meat carcasses in accordance with the invention;

Figure 2 is a side elevation of the apparatus looking from the right in Fig. 1;

Figure 3 is a plan view of the printing head of the apparatus;

Figure 4 is an end elevation of the printing head looking from the right in Fig. 3;

Figure 5 is a meat carcass which is printed using the apparatus, looking from the skin side;

Figure 6 shows the same carcass looking from the bone side;
and

Figures 7 and 8 are examples of composite marks which can be printed on the carcass using the apparatus.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to Fig.s 1 and 2, the carcass printing apparatus may be installed at the end of a slaughter line and includes a track 1 for conveying the meat carcasses *C* (e.g. a side of pork) from a loading end 2 to an unloading end 3. If desired, the preliminary cutting of the carcass may be carried out whilst the carcass is still moving on the track 1, either manually or mechanically, before the carcass is unloaded. The track may include chains or similar means suitable for carrying the meat carcasses one after another suspended from hooks in a head-end-down orientation, as seen in Fig. 2.

The apparatus includes a cabinet 5, which contains a computer for data processing and control, and a motorised robot 7 having a robotic arm 8 which comprises two or more relatively moveable sections. The arm carries a printing head 11 and is arranged to move the head in three mutually orthogonal axes (i.e. cartesian X, Y and Z axes) adjacent to the track 1 with provision for rotation of the printing head. The robot 7 is a standard industrial unit which may be completely encased within a liquid-impermeable jacket except for the head 11.

The robot moves the printing head relative to the carcasses in a pattern determined by the computer (see below). An optical system such as a CCD camera may be arranged to obtain a digital image of each carcass as it

moves along the track 1, and the computer may analyse the digital image to determine the presence, size and orientation of each carcass. The marking head is provided with a proximity sensor (not shown) for positioning the head at the optimum distance from the carcass for best print quality. This allows for shape variation between carcasses of similar size.

Means (not shown) may be provided for changing the orientation of the carcasses on the track 1 so that they present their skin side or bone side to the robot 7.

Referring to Fig.s 3 and 4, the printing head includes a circular mounting plate 15 which, in this example, carries two diametrically-spaced printing units 16 and 17 which use food-approved indelible printing ink. The plate can be rotated about its axis to change the orientation of the printing head when required. The first printing unit 16 is a "drop on demand" printer which can achieve reasonable print quality over a large area (e.g. 200 mm). The second unit 17 is an inkjet printer which allows finer detail to be achieved but in a smaller area.

Fig.s 5 and 6 show, by way of example, how a carcass may be printed to ensure that all of the primal cuts will bear an identification mark. On the skin side (Fig. 5) the marks are printed in two repeating vertical bands 20 and 21, as shown. On the bone side (Fig. 6) the marks are printed in two vertical bands 22 and 23 on opposite sides of the spinal column, the position of which is indicated at 24.

Fig. 7 shows a single identification mark which is repeated a number of

times in each band. The top component is a standard European health mark indicating the country of origin (in this case Norway). This is followed by a date field (DDMMYY), a code identifying the meat processing plant (68XXXX) and then a unique serial number identifying the carcass (053113). Below this, and most importantly, the carcass serial number is repeated in a machine-readable encoded form. Any part of the mark may be applied in invisible ink apart from the health mark.

Fig. 8 shows another form of the identification mark. Beneath the European health mark there is a unique serial number identifying the carcass (represented for illustrative purposes by the number "123456789") which is printed in a human and machine readable OCR font as a first means of electronic data capture. Alongside this the carcass serial number is repeated in the form of a series of lines in a binary format, similar to a bar code, which can be read into a computer using an optical scanning head. Again, the carcass number marking may be applied in invisible ink.

A record of the identification numbers applied to the carcasses is stored by the computer at processing plant together with other relevant information identifying the source of the carcass. After the carcass has been cut up and prior to packaging for sale to the consumer, the encoded identification number is read by machine and the identification code is then printed onto the product labelling in manually-readable form (i.e. 053113).

It will thus be appreciated that the system allows meat to be traced back from point-of-sale to the originating farm via the records made by the processing plant, and vice versa.

It will be appreciated that the features disclosed herein may be present in any feasible combination. Whilst the above description lays emphasis on those areas which, in combination, are believed to be new, protection is claimed for any inventive combination of the features disclosed herein.

CLAIMS

1. A method of improving the traceability of meat in which a unique carcass-identification mark is applied to selected areas of a meat carcass before the carcass is separated into primal cuts.
2. A method according to Claim 1, in which the carcass-identification mark includes a unique serial number.
3. A method according to Claim 1, in which the mark is applied in an encoded, machine-readable form.
4. A method according to Claim 1, in which the carcass-identification mark is applied to the carcass by means of an indelible ink.
5. A method according to Claim 1, in which the carcass-identification mark is applied to the carcass using a printing head which is carried and moved by a mechanical robotic arm under the control of a computer.
6. Carcass marking apparatus which includes:
 - a carrier system for moving prepared meat carcasses from a loading position to an unloading position;
 - sensing means for detecting the position of the meat carcasses during movement along the carrier system; and

- a marking head which is carried and moved by a mechanical robotic arm under the control of a computer in response to information provided by the sensing means in order to apply a unique carcass-identification mark to the carcass.

7. Carcass marking apparatus according to Claim 6, in which the marking head is provided with a proximity sensor for positioning the head close to the carcass.

8. Carcass marking apparatus according to Claim 6, in which the robotic arm is arranged to move the marking head in three mutually orthogonal axes.

9. Carcass marking apparatus according to Claim 6, in which the marking head is arranged to apply the mark to the carcass by means of an indelible ink.

10. Carcass marking apparatus according to Claim 6, in which the carrier system includes a series of suspension elements for suspending the carcasses therefrom.

AMENDED CLAIMS

[received by the International Bureau on 17 September 2001 (17.09.01);
original claims 1-10 replaced by amended claims 1-10 (3 pages)]

1. A method of improving the traceability of meat in which, under control of a computer (5), meat carcasses (C) move along a track (1) suspended on a series of suspension elements and a unique carcass-identification mark (Fig.s 7 and 8) is applied a plurality of times to selected areas of a meat carcass before the carcass is separated into primal cuts, and sensing means are provided for sensing the size of the meat carcasses as they travel along the track,

characterised in that

the carcass-identification marks are applied to each carcass by a single printing head (11) which is carried and moved by a mechanical robotic arm (8) which moves the printing head in three mutually orthogonal axes, and the printing head is provided with a proximity sensor for accurately positioning the head close to the carcass at each printing position which is determined according to the size of the carcass.

2. A method according to Claim 1, in which each carcass-identification mark includes a unique serial number.

3. A method according to Claim 2, in which the serial number is applied in a human-readable form which can also be read by machine.

4. A method according to Claim 1, in which each carcass-identification mark is applied in an encoded, machine-readable form.

5. A method according to Claim 1, in which the carcass-identification mark is applied to the carcass by means of an indelible ink.

6. Carcass marking apparatus in which, under control of a computer (5), meat carcasses (C) move along a track (1) suspended on a series of suspension elements and a unique carcass-identification mark (Fig.s 7 and 8) is applied a plurality of times to selected areas of a meat carcass before the carcass is separated into primal cuts, and sensing means are provided for sensing the size of the meat carcasses as they travel along the track,

characterised in that

the carcass-identification marks are applied to each carcass by a single printing head (11) which is carried and moved by a mechanical robotic arm (8) which moves the printing head in three mutually orthogonal axes, and the printing head is provided with a proximity sensor for accurately positioning the head close to the carcass at each printing position which is determined according to the size of the carcass.

7. Apparatus according to Claim 6, in which each carcass-identification mark includes a unique serial number.

8. Apparatus according to Claim 7, in which the serial number is applied in a human-readable form which can also be read by machine.

9. Apparatus according to Claim 6, in which each carcass-identification mark is applied in an encoded, machine-readable form.

10. Apparatus according to Claim 6, in which the carcass-

identification mark is applied to the carcass by means of an indelible ink.

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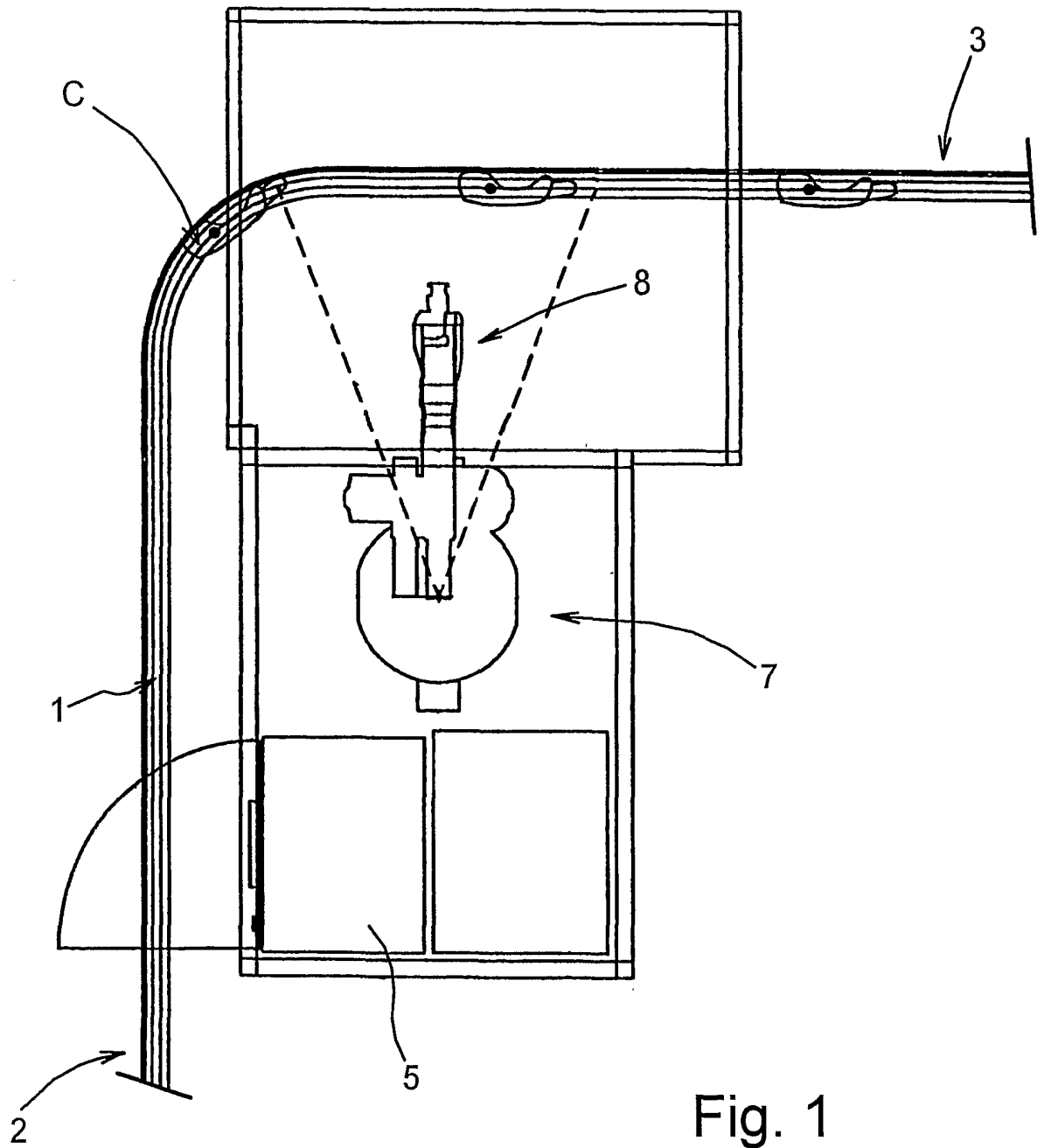


Fig. 1

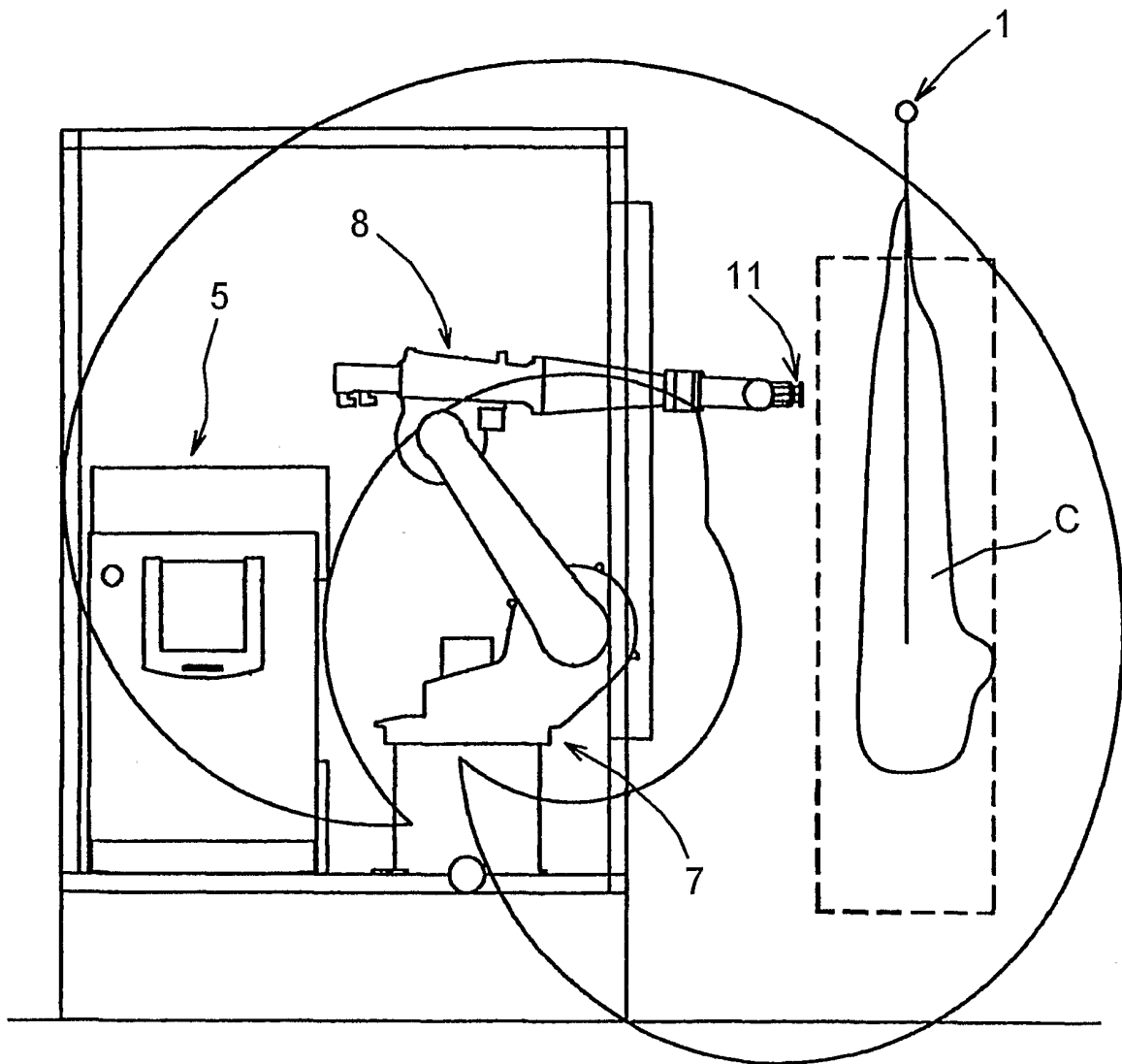


Fig. 2

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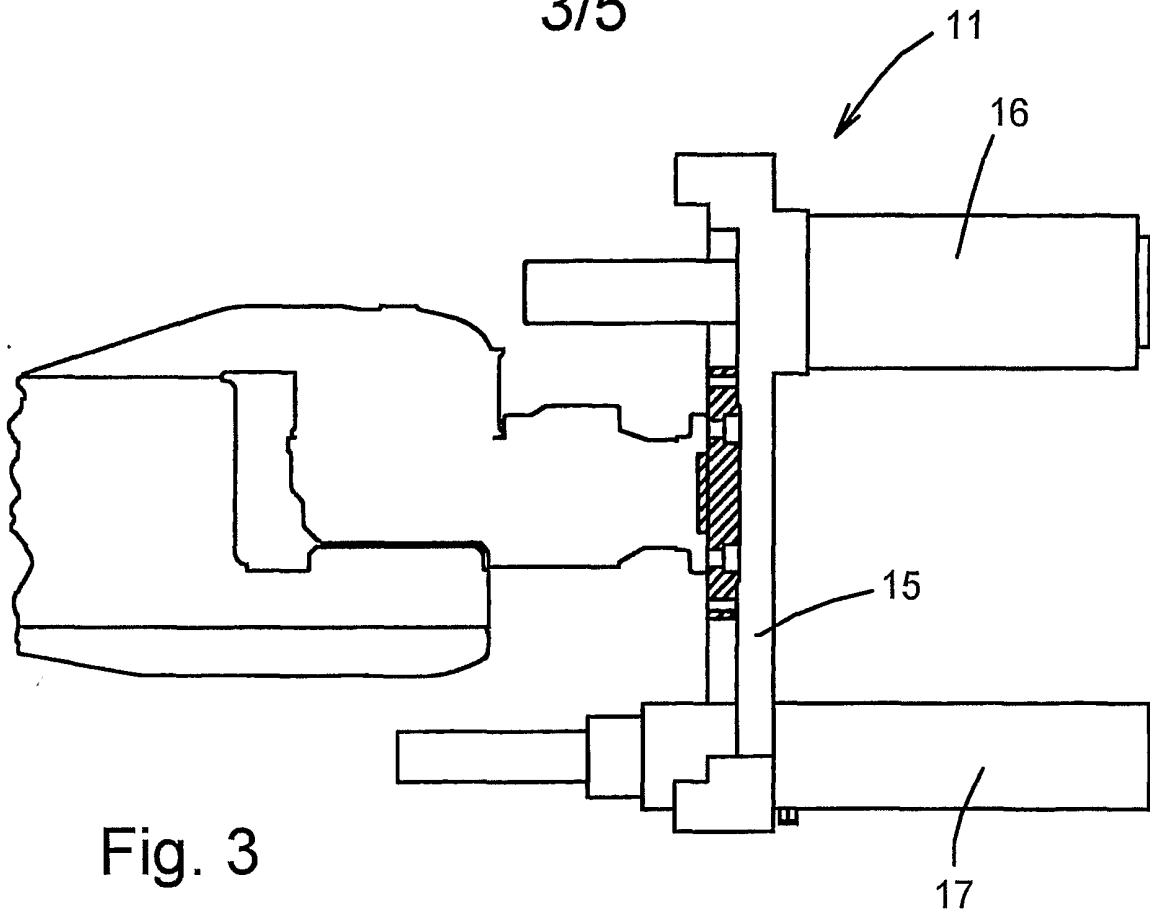


Fig. 3

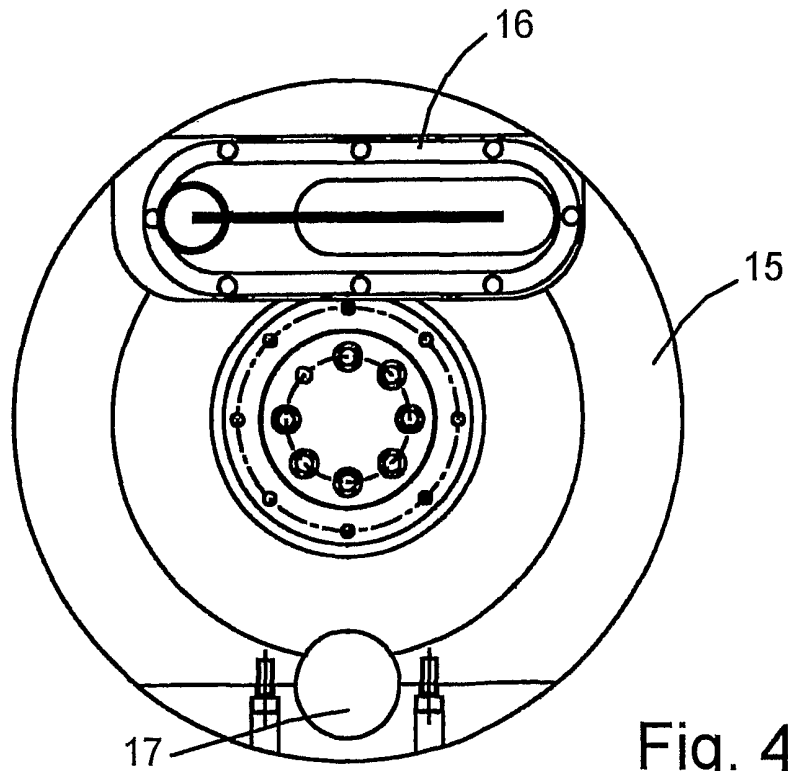
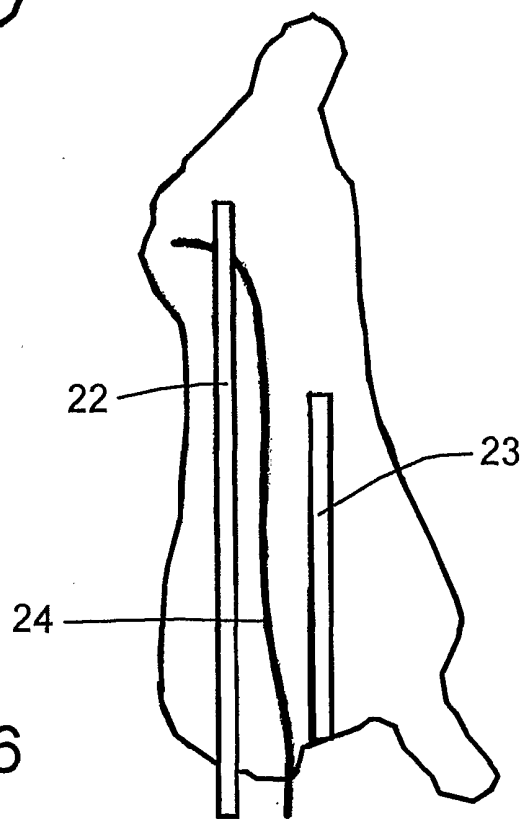
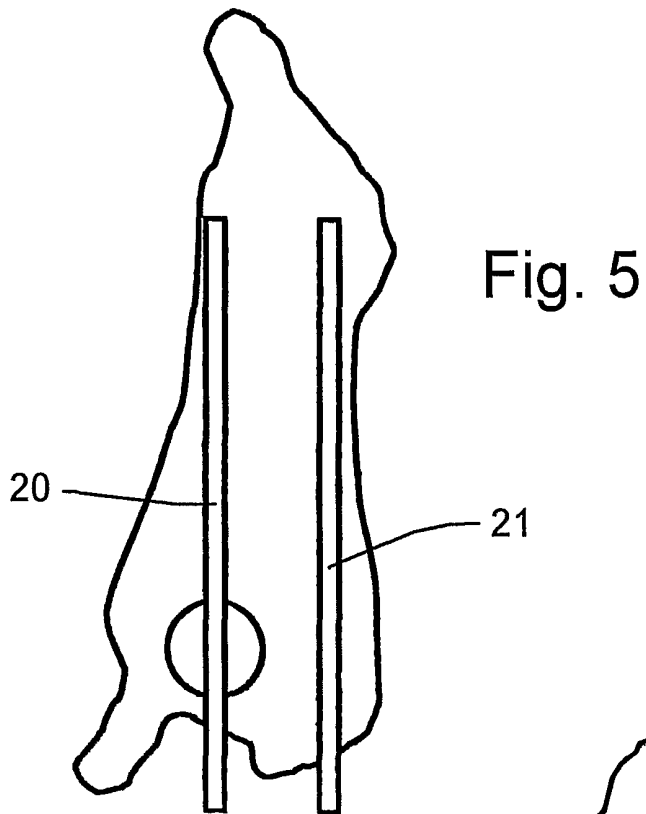


Fig. 4

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DDYYMM
68XXXX
053113



Fig. 7

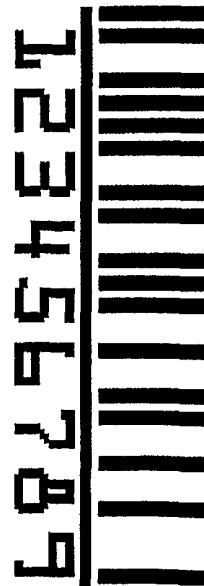
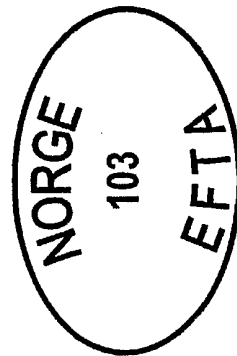


Fig. 8

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 01/01824

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A22B5/00 A01K11/00

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 7 A22B A01K B41K B65C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EPO-Internal, PAJ, WPI Data, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	column 13, line 1-33; figure 5 ---	4,5
X	US 5 411 435 A (DURAND) 2 May 1995 (1995-05-02)	1
A	column 5, line 55-60; figure 3 ---	2-4,6-10
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A	column 10, line 12-55 column 31, line 42 -column 32, line 53 column 34, line 2-14; figures 1,10 ---	4-10
	-/--	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° 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

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 01/01824

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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