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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
5 November 2015 (05.11.2015)

WIPO | PCT

(10) International Publication Number
WO 2015/164927 A1

(51) International Patent Classification:
A01K 11/00 (2006.01) *A01K 1/00* (2006.01)

(21) International Application Number:
PCT/AU2015/050208

(22) International Filing Date:
30 April 2015 (30.04.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/987,329 1 May 2014 (01.05.2014) US

(71) Applicant: **ALEIS PTY LTD** [AU/AU]; Cnr Rosevale Road, Jandowae, Queensland 4410 (AU).

(72) Inventors: **WILKINSON, Benjamin Thomas John**; 36 Double Jump Road, Redland Bay, Queensland 4165 (AU). **CLAYTON, Brian Antony**; 224 Facer Road, Burpengary, Queensland 4505 (AU). **FINLAYSON, Frank John**; 36 Gordon Street, Aramac, Queensland 4726 (AU). **GUNSTON, Patrick Bernard**; 85 Tallow Wood Place, Mount Gravatt East, Queensland 4122 (AU).

(74) Agents: **ELLIS TERRY** et al.; PO Box 10932, The Terrace, Wellington, 6143 (NZ).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: ANIMAL IDENTIFICATION SYSTEMS

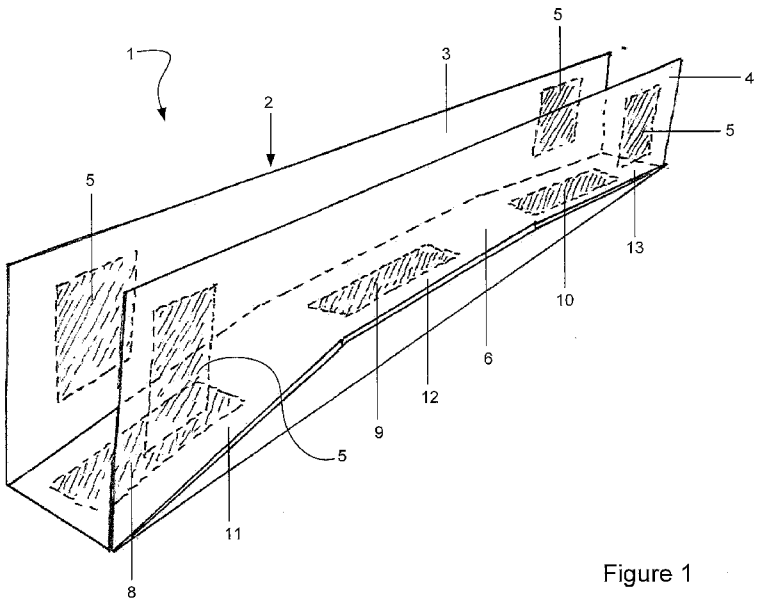

Figure 1

(57) Abstract: An animal identification system, including: a race including a pair of opposed walls between which, in use, animals pass, and a floor including one or more steps or sloping sections defining a height change; one or more readers configured to read electronic animal identification devices borne by animals passing along the race; wherein, at least one of the one or more readers is positioned beneath, on top of or within the floor at or near the height change such that, in use, movement of the animals caused by the height change tends to bring the animals' identification devices into closer proximity to that reader.

WO 2015/164927 A1

Published:

— *with international search report (Art. 21(3))*

ANIMAL IDENTIFICATION SYSTEMS

FIELD OF THE INVENTION

The invention relates to animal identification systems, in particular to systems arranged to read electronic identification devices borne by animals as the animals pass along a race.

BACKGROUND TO THE INVENTION

Electronic identification (EID) systems are now commonly used in agricultural applications. In particular EID ear tags, anklet tags, intra-ruminal devices, implants and the like are carried by many animals, and those animals can be individually identified by reading the EID device.

EID readers may be incorporated in a race system, for example as disclosed in Allflex Australia Pty Ltd's US Patent No. 8,154,465. That system includes a portal antenna positioned at a mind point of a race, such that animals passing along the race will also pass through the antenna structure.

It would be desirable to improve the performance of prior ID reader systems, by improvement of ease of use, the accuracy of ID reads collected, increasing the number of reads possible over a time period, or reduction of the number of missed reads.

Reference to any prior art in this specification does not constitute an admission that such prior art forms part of the common general knowledge.

It is an object of the invention to provide an improved animal identification system, or at least to provide the public with a useful choice.

SUMMARY OF THE INVENTION

In a first aspect the invention provides an animal identification system, including: a race including a pair of opposed walls between which, in use, animals pass, and a floor including one or more steps or sloping sections defining a height change; one or more readers configured to read electronic animal identification devices borne by animals passing along the race; wherein, at least one of the one or more readers is positioned beneath, on top of or within the floor at or near the height change such that, in use, movement of the animals caused by the height change tends to bring the animals' identification devices into closer proximity to that reader.

Preferably the height change is defined by an upwardly sloping ramp.

Preferably the animal identification devices are borne by the animals' heads and the height change causes animals to drop their heads.

Preferably the system includes at least two readers positioned beneath, on top of or within the floor and being oriented at different angles with respect to a vertical plane.

In another aspect the invention provides an animal identification system, including: a race including a pair of opposed walls between which, in use, animals pass; and one or more readers configured to read electronic animal identification devices borne by animals passing along the race; wherein the race has a structure that causes animals to move within the race such that identification devices borne by the animals are moved in a non-linear manner through the race, this non-linear movement tending to bring the animals' animal identification devices into closer proximity to at least one of the one or more readers.

Optionally the at least one of the one or more readers is positioned on one of the opposed walls and the race structure is configured to cause sideways movement of the animals as they pass along the race.

Optionally the race structure includes one or more includes one or more projections, curves or undulations configured to cause the sideways movement.

Optionally the animal identification devices are borne by the animals' heads and the sideways movement is sideways movement of the animals' heads.

Preferably the race structure includes one or more includes one or more steps or sloping sections defining a height change, configured to cause vertical movement of the animal's heads as they pass along the race.

Preferably at least one of the one or more readers is positioned beneath, on top of or within the floor at or near the height change such that, in use, movement of the animals caused by the height change tends to bring the animals' identification devices into closer proximity to that reader.

Preferably the height change is defined by an upwardly sloping ramp.

Preferably the animal identification devices are borne by the animals' heads and the height change causes animals to drop their heads.

Preferably the system includes at least two readers positioned beneath, on top of or within the floor and being oriented at different angles.

Preferably the pair of opposed walls define one or more undulations.

Optionally the pair of opposed side walls define a single undulation.

Optionally the race has a generally U, C or V shape.

Preferably the pair of opposed side walls define two or more undulations.

Preferably the race has a generally S, Z or W shape.

Optionally the undulations define a continuous curved surface.

Alternatively the undulations define a discontinuous surface with a number of substantially planar sections arranged at an angle to each other.

Preferably the length of each undulation is between 0.5 and 2 times the average body length of the animals to be identified.

Preferably the length of each undulation is between 0.7 and 1.5 times the average body length of the animals to be identified.

In a further aspect the invention provides an animal identification system including: a race including a pair of opposed walls between which, in use, animals pass, the pair of opposed walls defining one or more undulations; and a plurality of ID readers positioned to read animal ID devices borne by animals passing along the path.

Optionally the pair of opposed side walls define a single undulation.

Optionally the race has a generally U, C or V shape.

Preferably the pair of opposed side walls define two or more undulations.

Preferably the race has a generally S, Z or W shape.

Optionally the undulations define a continuous curved surface.

Alternatively the undulations define a discontinuous surface with a number of substantially planar sections arranged at an angle to each other.

Preferably the length of each undulation is between 0.5 and 2 times the average body length of the animals to be identified.

Preferably the length of each undulation is between 0.7 and 1.5 times the average body length of the animals to be identified.

In another aspect the invention provides an animal identification system, including: a race including a pair of opposed walls defining a path along which, in use, animals pass; one or more readers configured to read electronic animal identification devices borne by animals passing along the path through the race; wherein the opposed walls include at least one angled wall portion that is non-parallel with the path, and wherein at least one reader is mounted on the angled wall portion such that the reader is positioned at an acute angle to the path.

Preferably the race is at least 1.5 metres in length.

Preferably the race is at least 2.5 metres in length.

Preferably the opposing walls are arranged at an angle to the ground, such that the race is narrower at ground level than at a higher point.

Preferably at least some of the ID readers are positioned on the opposing walls.

Preferably at least some of the ID readers are oriented at different angles to each other.

Preferably the animal identification devices are ear tags.

Alternatively the animal identification devices are animal intra-ruminal devices, implants, or similar devices.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows an animal identification system according to one embodiment;
Figure 2 shows a floor profile according to one embodiment;
Figure 3 shows a floor profile according to a further embodiment;
Figure 4 shows a floor profile according to another embodiment;
Figure 5 shows a floor profile according to a further embodiment;
Figure 6 shows an animal identification system according to another embodiment;
Figure 7 shows an animal identification system according to a further embodiment;
Figure 8 shows a wall profile according to one embodiment;
Figure 8A shows a wall profile according to a further embodiment;
Figure 8B shows a wall profile according to another embodiment;
Figure 9 shows a wall profile according to a further embodiment;
Figure 9A shows a wall profile according to another embodiment;
Figure 9B shows a wall profile according to a further embodiment;
Figure 10 shows a wall profile according to another embodiment;
Figure 11 shows a wall profile according to a further embodiment;
Figure 12 shows a wall profile according to another embodiment;
Figure 13 shows a wall profile according to a further embodiment; and
Figure 14 shows an animal identification system according to another embodiment.

DETAILED DESCRIPTION

Figures 1 to 5 illustrate embodiments of animal identification reader systems which use a height change, slope or step in the race in order to improve performance of the identification system.

Figure 1 shows an identification system 1 including an animal race 2 defined by a pair of opposing walls 3, 4. The system 1 also includes a number of ID readers configured to read identification devices borne by animals passing along the race 2. The ID readers may include one or more ID readers 5 (marked schematically in Figure 1) either built into the wall, or attached to the inside, or attached to the outside of the opposing walls 3, 4. Further, one or more ID readers 8, 9, 10 may be built into the floor 6, or positioned beneath the floor 6 of the race 2.

As shown in Figure 1, in this embodiment the floor 6 is not a flat floor. Rather, the floor includes a first upwardly sloping ramp section 11, a flat section 12 and a downwardly sloping ramp section 13. In a preferred embodiment at least one ID reader 8, 9, 10 is positioned beneath each of these three sections 11, 12, 13 of floor 6.

In preferred embodiments, at least one ID reader is positioned at or near a height change in the floor 6. For example, in the embodiment of Figure 1 the ID reader 8 is positioned beneath the upwardly sloping ramp section 11 of floor 6. As an animal passes along the race 2, the upwards slope tends to cause the animal to drop its head. An animal identification device borne on the animal's head (for example an ear tag or an implant somewhere on the animal's head) will therefore move downwards, closer to the ID reader 8. In other words, the structure of the race tends to cause movement of the animal so as to bring the identification device into closer proximity to the ID reader. This has the result of improving the quality of reading of the identification device by the ID reader 8.

As shown in Figure 1, the readers 5, 8, 9, 10 are mounted on the floor 6 and walls 3, 4 of the race 2. Further, the system is preferably free of overhead structures, such as the beams, overhead antenna structures and the like used in some prior systems. The race is therefore open to the top, and this is believed to improve flow of animals through the race, and also allows better access to the race for workers and working dogs etc. In use, farm workers can easily walk along the race or lean over the top of the walls 3, 4 without being impeded by the structure of the race or the reader system.

Figures 2 to 4 each show a possible floor profile 15, viewed from the side and with the opposing walls 3, 4 omitted for clarity. Figure 2 shows a profile similar to that of Figure 1, with a first upwardly sloping ramp section 11, a flat section 12 and a downwardly sloping ramp section 13, with an ID reader 8, 9, 10 positioned beneath each of these three sections 11, 12, 13 of floor 6. As shown, the ID readers 8 and 10 may be either built into, or attached to the top, or attached to the underside of the sloping ramp sections 11, 12, 13, or to any suitable supporting structure. This presents the ID reader at an angle to the vertical, which creates further diversity in the read system. Thus, the first antenna 8 is at an angle to both vertical and horizontal, back towards the entrance 16 of the race 2. The second antenna 9 is mounted beneath the flat section 12 of floor 6 and therefore points directly upwards. The third antenna 10 is mounted beneath the downwardly sloping ramp section 13 and is at an angle to both vertical and horizontal, away from the entrance 16 of the race 2.

These different angles create diversity in the reader system, providing different possibilities for the read antennas to pick up signals from animal identification devices. In general it will be enough for each animal identification device to be read successfully by one antenna as it is borne along the race.

Figure 3 shows a further floor profile 15, with a raised floor section 18 positioned between two lowered or ground level sections 19, 20. The raised floor section 18 is

defined by upwards and downwards steps 21, 22. ID readers 23, 24, 25 may be mounted beneath the raised floor section 18, either directly to the underside of the floor or on some other supporting structure. The ID readers may be arranged horizontally, as shown for ID readers 23, 24, or supported on an angle, as shown for ID reader 25.

Figure 4 shows a further floor profile 15, with a first downwardly sloping ramp section 27, a flat section 28 and an upwardly sloping ramp section 29, with an ID reader 30, 31, 32 positioned beneath each of these three sections 27, 28, 29 of floor 6. Again, the ID readers may be attached to the underside of the floor, or to any suitable supporting structure.

Figure 5 shows another floor profile 15, with a lowered floor section 34 positioned between two raised sections 35, 36. The lowered floor section 34 is defined by downwards and upwards steps 37, 38. ID readers 40, 41, 42, 43 may be mounted beneath the raised floor sections 35, 36, either directly to the underside of the floor or on some other supporting structure. The ID readers may be vertical, as shown for ID readers 40, 43, or supported on an angle, as shown for ID readers 41, 42.

In general, a floor having one or more steps, slopes or height changes will cause an animal to move along the race in such a manner that its does not follow a horizontal, linear path along the race. An ID reader can be appropriately positioned such that the movement caused brings the identification device into closer proximity to the ID reader.

Embodiments using ramps rather than steps are preferred, as these will create the minimum impediment to animal movement along the race.

Further, this concept may be extended by using one or more projections, curves or other features causing animal movement in the horizontal plane. Such features can be used to cause movement of animal identification devices into closer proximity to

one or more ID readers positioned on the opposing walls of the race 2, such as readers 5 in Figure 1.

The Applicant has also found that the performance of ID reader systems can be improved by use of a race structure that encourages a smoother or more regulated flow of animals through the race. This decreases the number of identification devices that are simultaneously presented to individual readers, thereby improving read quality, as well as increasing the usability of the system as a whole.

In particular, the Applicant has found that undulating race walls tend to cause animals both to self-sort at the entrance to the race and also to flow relatively smoothly and evenly spaced from each other through the race itself. This can be contrasted with prior races having straight walls, where the animals tend to bunch together at the entrance, creating a bottle neck, and tend not to flow evenly along the race.

In some embodiments the Applicant's undulating walls are sufficiently widely spaced that animals can follow a straight path along the race between the undulating walls. Particularly for sheep races the walls may be sufficiently widely spaces that animals can pass along the race on a straight path two abreast. In other embodiments the undulating walls may define an undulating path, where some sideways movement of the animal is required as it passes through the race.

Figure 6 shows one embodiment of animal identification system 1, in which the opposing walls 3, 4 are both undulating walls having a relatively smooth wave-like form. In this embodiment the opposing walls 3, 4 are also at an angle to the vertical, as is clear from the ends 46, 47 of the two walls 3, 4 at the entrance 16 of the race 2. The race is therefore somewhat wider at the top than it is at the level of the floor 6. This is also believed to aid the regulated flow of animals through the race. The range of angles of the walls may range from 10 to 25 degrees from a vertical axis. Other angles may be suitable for some applications.

In the embodiment of Figure 6, a number of ID readers 5 are positioned on the outside of the opposing walls 3, 4. Further, at least some of these readers may be positioned at different points on the undulations of the walls 3, 4, such that they will not all be at the same angle. This can be most clearly seen by comparison between ID readers 48, 49. Again, this provides improved diversity in the read system, with the ID readers collectively more likely to pick up signals from animal identification devices moving along the race 2.

Figure 7 shows a further embodiment of animal identification system 1, in which the opposing walls 3, 4 are both undulating walls formed by a number of planar sections at an angle to each other. A first opposing wall 3 includes generally planar wall sections 50, 51, 52 and a second opposing wall 4 includes generally planar wall sections 53, 54, 55.

Figures 8 to 13 each show a possible undulating wall profile, viewed from the top. Any undulating wall profile may, if desired, be arranged at an angle to the vertical to define a race narrower at floor or ground level than at its top surface. Note that, in some embodiments, the two walls do not need to be parallel or “in phase” with each other.

Figure 8 shows opposing walls 3, 4, which are both undulating walls having a relatively smooth wave-like form, similar to the walls of Figure 6. These walls are generally S-shaped and define a generally S-shaped race 2.

Figure 8A shows opposing walls 3, 4, which are both undulating walls having a relatively smooth wave-like form, similar to the walls of Figure 6. These walls are generally S-shaped but are offset and define a race with an undulating width.

Figure 8B shows opposing walls 3, 4, which are both undulating walls having a relatively smooth wave-like form, similar to the walls of Figure 6. These walls are

generally S-shaped and define a generally S-shaped race 2. These walls are somewhat offset from each other, but not to the extent of Figure 8A.

Figure 9 shows opposing walls 3, 4, which are both undulating walls formed by a number of planar sections arranged at an angle to each other, similar to the walls of Figure 7. These walls are generally W-shaped and define a generally W-shaped race 2.

Figure 9A shows opposing walls 3, 4, which are both undulating walls formed by a number of planar sections arranged at an angle to each other, similar to the walls of Figure 7. These walls are generally W-shaped but are offset and define a race with an undulating width.

Figure 9B shows opposing walls 3, 4, which are both undulating walls formed by a number of planar sections arranged at an angle to each other, similar to the walls of Figure 7. These walls are generally W-shaped and define a generally W-shaped race 2. These walls are somewhat offset from each other, but not to the extent of Figure 9A.

Figure 10 shows opposing walls 3, 4, which are also both undulating walls formed by a number of planar sections arranged at an angle to each other, similar to the walls of Figure 7. These walls are generally Z-shaped and define a generally Z-shaped race 2.

Figure 11 shows opposing walls 3, 4, which are both undulating walls having a relatively smooth wave-like form, similar to the walls of Figure 6. These walls are generally U-shaped and define a generally U-shaped race 2.

Figure 12 shows opposing walls 3, 4, which are both undulating walls having a relatively smooth wave-like form, similar to the walls of Figure 6. These walls are generally C-shaped and define a generally C-shaped race 2.

Figure 13 shows opposing walls 3, 4, which are also both undulating walls formed by a number of planar sections arranged at an angle to each other, similar to the walls of Figure 7. These walls are generally V-shaped and define a generally V-shaped race 2.

As with the generally S or W shaped walls of Figures 8 to 8B and 9 to 9B, the generally Z, U, C or V shaped walls of Figures 10 to 13 may be parallel or in phase (as shown in Figures 10 to 13) or may be offset from each other or out of phase.

As is clear from the above example, the terms “undulation” and “undulating” are used in this specification to refer to curved or angled surfaces. Surfaces defining a single curved or angled change of direction, such as the U, C or V shaped walls of Figures 11 to 13 include a single undulation. Surfaces defining two curved or angled changes of direction, such as the Z shaped walls of Figure 10, include two undulations. The W shaped walls of Figure 9 define three undulations and the S shaped walls shown in Figure 8 define 4 undulations.

Preferred embodiments include walls defining two or more undulations. However in some embodiments walls having single undulations may be used.

Figure 14 shows a further embodiment of identification system including a floor profile with a height change and an undulating wall profile. The floor profile of Figure 14 is a ramp structure similar to that of Figures 1 and 2. The wall profile is a generally Z-shaped profile similar to that of Figures 7 and 10. This embodiment provides still further improvements in read performance. The undulating walls 3, 4 promote smooth rapid flow of animals through the race 2. Further, the quality of reads is improved by the floor structure, which tends to cause animals to bring their heads (and therefore identification devices borne on their heads) into closer proximity to at least one of the readers 8, 9, 10 positioned beneath the floor 6. Further, the readers 5, 8, 9, 10 are mounted at various angles to the animal path,

being mounted on the sloping and flat sections 11, 12, 13 of the floor as well as on various angled sections of the walls 3, 4. This diversity of ID reader orientation improves read quality.

In general any suitable floor profile defining a slope, step or height change (including any of the profiles shown in Figures 1 to 5) may be used together with any suitable undulating wall profile (including any of the profiles shown in Figures 6 to 13).

The length of the race 2 may vary depending upon species and the style of undulation employed. For example a C-shaped race may be relatively short (around 1-2 metres) where as a Z or S shaped race may be more than 2 metres, around 2 to 5 metres in length. In other embodiments the race may be more than 4 metres in length.

The length of each undulation may also depend upon species and style of undulation. However, typically each undulation may be around 0.5 to 2 times the average body length of the typical animal of the desired species, preferably around 0.7 to 1.5 times the average body length of the typical animal of the desired species, more preferably approximately equal to the average body length of the typical animal of the desired species.

When viewed from above, the distance from the inside to the outside of each undulation could vary depending upon the use of angled walls as described above, but typically will be around 1 to 2.5, preferably around 1.5 to 2, more preferably around 1.75 times the average width of an average animal in a given species at shoulder height. As an example, shorn sheep are usually on average around 350 mm wide – so the undulations may be around 1.75 x 350 mm, or approximately 600 mm deep.

The animal race may have a height suited to the species in question. For sheep and other small stock the height may be around 1 metre, while for cattle, deer, etc the race may be around 1.8 metres or more in height.

The Applicant's reader systems may be used with any suitable reader technology, including low frequency and ultra high frequency (UHF) readers.

The Applicant's reader systems may also be used with any suitable type of animal identification device, including ear tags, anklets, intra-ruminal devices, implants, or similar devices. The animal identifications devices are capable of emitting an identification signal, and may rely on any suitable identification technology, including RFID (radio frequency identification), and other electronic identification technologies. The identification devices may be any suitable devices, including implants, ear tags, boluses, anklet devices etc.

The Applicant's race structure may be installed permanently in animal yards etc. Alternatively the race structure may be provided in a mobile form, for example as a number of modules or interlocking elements that can be dismantled for transport. The race structure should be formed from a material that does not interfere with the functioning of the read system. Preferably the race is formed from timber, plywood or similar, or more preferably from plastic materials. The race structure may be moulded from suitable plastics such as any suitable thermoplastic, or moulded rubber, or timber hybrid, or composite material.

In use, the Applicant's systems may be used in conjunction with any suitable yards, races, drafting systems or other barriers suitable for introducing animals to the entrance of the race 2 and for directing flow of animals after exiting the race 2.

Any of the above embodiments may be free of overhead structures, such as the beams, overhead antenna structures and the like used in some prior systems. Any of the above embodiments may be adapted if necessary such that the opposing

walls 3, 4 are at an angle to the vertical, to form a race is therefore somewhat wider at the top than it is at the level of the floor 6.

While the present invention has been illustrated by the description of the embodiments thereof, and while the embodiments have been described in detail, it is not the intention of the Applicant to restrict or in any way limit the scope of the appended claims to such detail. Further, the above embodiments may be implemented individually, or may be combined where compatible. Additional advantages and modifications, including combinations of the above embodiments, will readily appear to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, representative apparatus and methods, and illustrative examples shown and described. Accordingly, departures may be made from such details without departure from the spirit or scope of the Applicant's general inventive concept.

CLAIMS

1. An animal identification system, including:
   i. a race including a pair of opposed walls between which, in use, animals pass, and a floor including one or more steps or sloping sections defining a height change;
   ii. one or more readers configured to read electronic animal identification devices borne by animals passing along the race;

   wherein, at least one of the one or more readers is positioned beneath, on top of or within the floor at or near the height change such that, in use, movement of the animals caused by the height change tends to bring the animals' identification devices into closer proximity to that reader.

2. An animal identification system as claimed in claim 1 wherein the height change is defined by an upwardly sloping ramp.

3. An animal identification system as claimed in any preceding claim wherein the animal identification devices are borne by the animals' heads and the height change causes animals to drop their heads.

4. An animal identification system as claimed in any preceding claim including at least two readers positioned beneath, on top of or within the floor and being oriented at different angles with respect to a vertical plane.

5. An animal identification system, including:
   i. a race including a pair of opposed walls between which, in use, animals pass; and
   ii. one or more readers configured to read electronic animal identification devices borne by animals passing along the race;

   wherein the race has a structure that causes animals to move within the race such that identification devices borne by the animals are moved in a non-linear

manner through the race, this non-linear movement tending to bring the animals' animal identification devices into closer proximity to at least one of the one or more readers.

6. An animal identification system as claimed in claim 5 wherein the at least one of the one or more readers is positioned on one of the opposed walls and the race structure is configured to cause sideways movement of the animals as they pass along the race.

7. An animal identification system as claimed in claim 6 wherein the race structure includes one or more includes one or more projections, curves or undulations configured to cause the sideways movement.

8. An animal identification system as claimed in claim 6 or 7 wherein the animal identification devices are borne by the animals' heads and the sideways movement is sideways movement of the animals' heads.

9. An animal identification system as claimed in claim 5 wherein the race structure includes one or more includes one or more steps or sloping sections defining a height change, configured to cause vertical movement of the animal's heads as they pass along the race.

10. An animal identification system as claimed in claim 9 wherein at least one of the one or more readers is positioned beneath, on top of or within the floor at or near the height change such that, in use, movement of the animals caused by the height change tends to bring the animals' identification devices into closer proximity to that reader.

11. An animal identification system as claimed in claim 9 or 10 wherein the height change is defined by an upwardly sloping ramp.

12. An animal identification system as claimed in any one of claims 9 to 11 wherein the animal identification devices are borne by the animals' heads and the height change causes animals to drop their heads.

13. An animal identification system as claimed in any one of claims 9 to 12 including at least two readers positioned beneath, on top of or within the floor and being oriented at different angles.

14. An animal identification system as claimed in any preceding claim wherein the pair of opposed walls define one or more undulations.

15. An animal identification system as claimed in claim 14 wherein the pair of opposed side walls define a single undulation.

16. An animal identification system as claimed in claim 15 wherein the race has a generally U, C or V shape.

17. An animal identification system as claimed in claim 14 wherein the pair of opposed side walls define two or more undulations.

18. An animal identification system as claimed in claim 17 wherein the race has a generally S, Z or W shape.

19. An animal identification system as claimed in any one of claims 14, 15 or 17 wherein the undulations define a continuous curved surface.

20. An animal identification system as claimed in any one of claims 14, 15 or 17 wherein the undulations define a discontinuous surface with a number of substantially planar sections arranged at an angle to each other.

21. An animal identification system as claimed in any one of claims 14 to 20 wherein the length of each undulation is between 0.5 and 2 times the average body length of the animals to be identified.

22. An animal identification system as claimed in any one of claims 14 to 21 wherein the length of each undulation is between 0.7 and 1.5 times the average body length of the animals to be identified.

23. An animal identification system including:
    i. a race including a pair of opposed walls between which, in use, animals pass, the pair of opposed walls defining one or more undulations; and
    ii. a plurality of ID readers positioned to read animal ID devices borne by animals passing along the path.

24. An animal identification system as claimed in claim 23 wherein the pair of opposed side walls define a single undulation.

25. An animal identification system as claimed in claim 24 wherein the race has a generally U, C or V shape.

26. An animal identification system as claimed in claim 23 wherein the pair of opposed side walls define two or more undulations.

27. An animal identification system as claimed in claim 26 wherein the race has a generally S, Z or W shape.

28. An animal identification system as claimed in any one of claims 23, 24 or 26 wherein the undulations define a continuous curved surface.

29. An animal identification system as claimed in any one of claims 23, 24 or 26 wherein the undulations define a discontinuous surface with a number of substantially planar sections arranged at an angle to each other.

30. An animal identification system as claimed in any one of claims 23 to 29 wherein the length of each undulation is between 0.5 and 2 times the average body length of the animals to be identified.

31. An animal identification system as claimed in any one of claims 23 to 30 wherein the length of each undulation is between 0.7 and 1.5 times the average body length of the animals to be identified.

32. An animal identification system, including:
    i. a race including a pair of opposed walls defining a path along which, in use, animals pass;
    ii. one or more readers configured to read electronic animal identification devices borne by animals passing along the path through the race;

    wherein the opposed walls include at least one angled wall portion that is non-parallel with the path, and wherein at least one reader is mounted on the angled wall portion such that the reader is positioned at an acute angle to the path.

33. An animal identification system as claimed in any preceding claim wherein the race is at least 1.5 metres in length.

34. An animal identification system as claimed in any preceding claim wherein the race is at least 2.5 metres in length.

35. An animal identification system as claimed in any preceding claim wherein the opposing walls are arranged at an angle to the ground, such that the race is narrower at ground level than at a higher point.

36. An animal identification system as claimed in any preceding claim wherein at least some of the ID readers are positioned on the opposing walls.

37. An animal identification system as claimed in any preceding claim wherein at least some of the ID readers are oriented at different angles to each other.

38. An animal identification system as claimed in any preceding claim wherein the animal identification devices are ear tags.

39. An animal identification system as claimed in any one of claims 1 to 37 wherein the animal identification devices are animal intra-ruminal devices, implants, or similar devices.

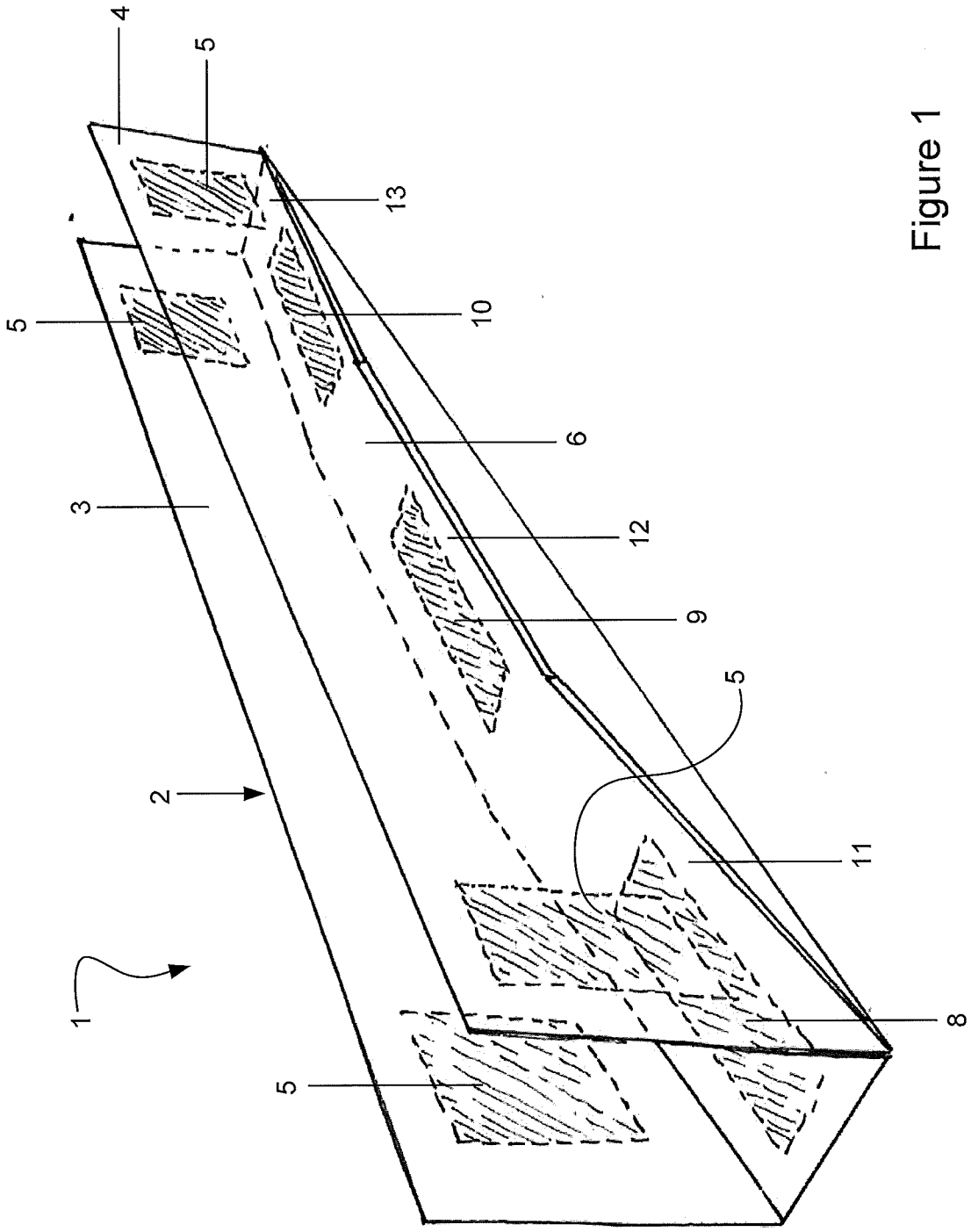

Figure 1

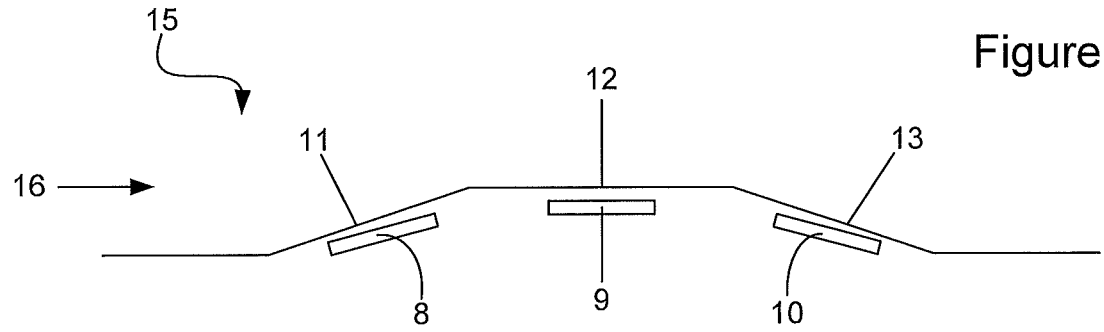

Figure 2

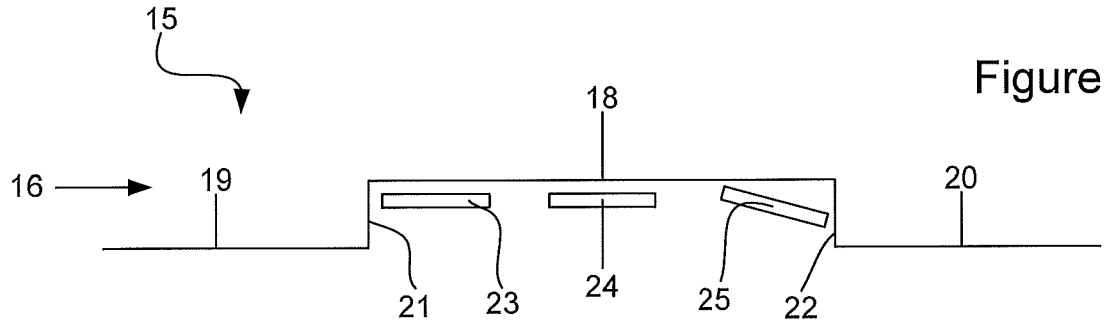

Figure 3

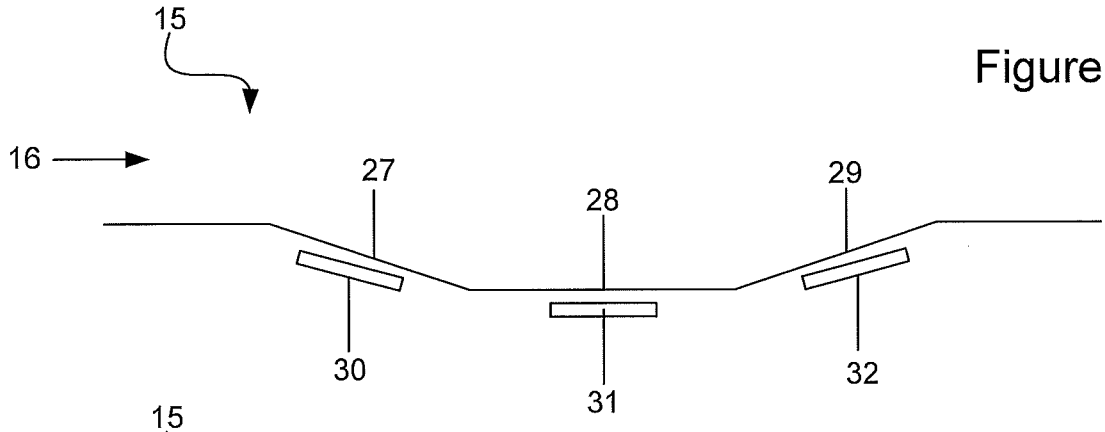

Figure 4

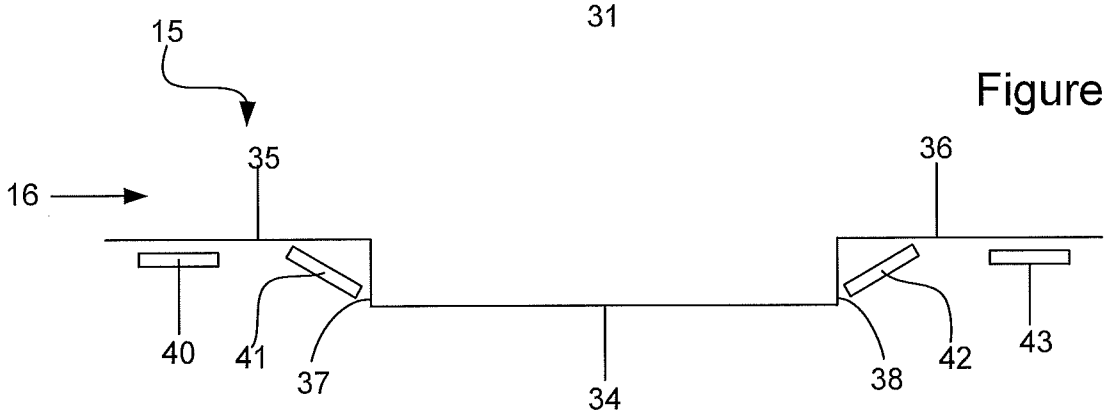

Figure 5

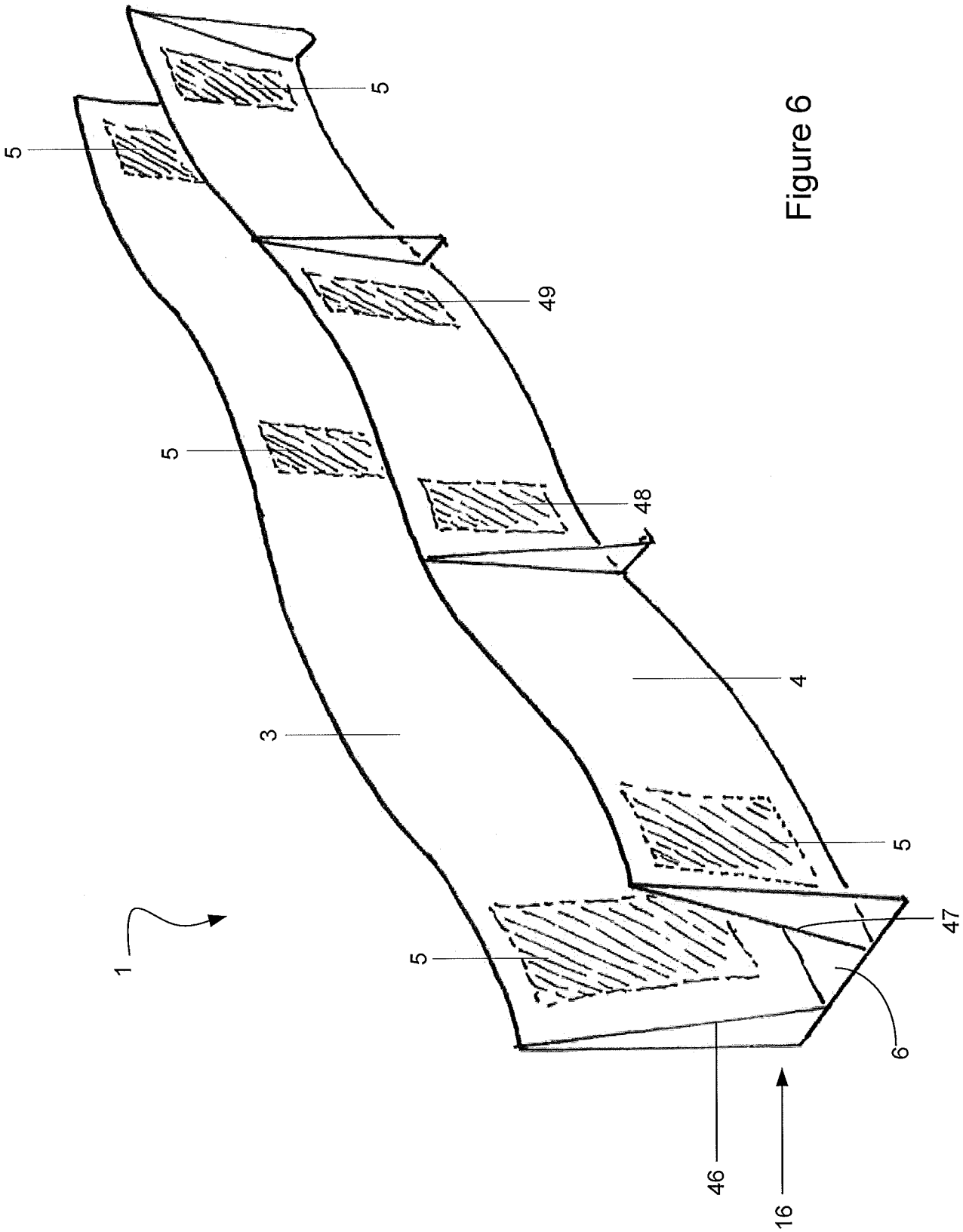

Figure 6

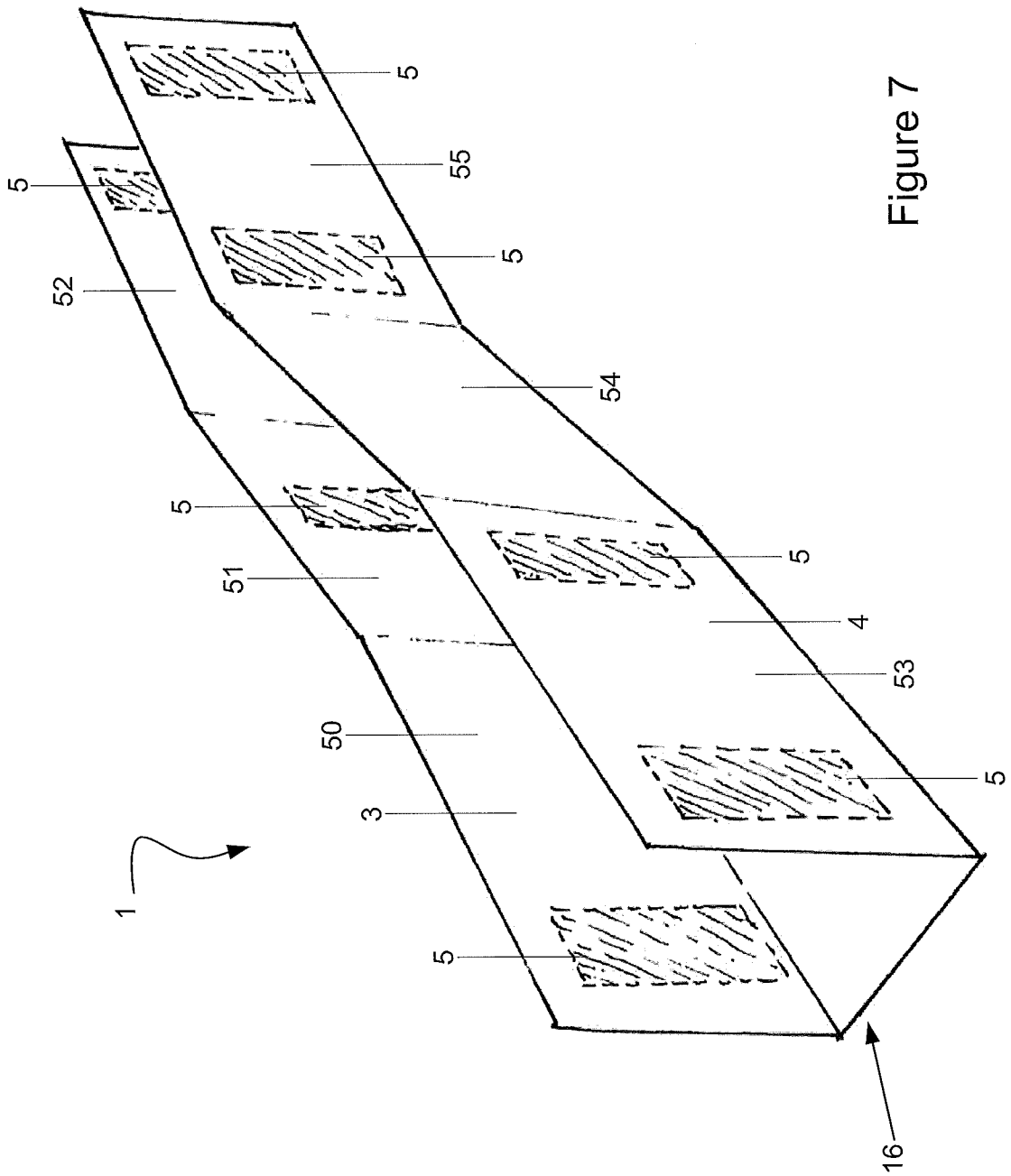

Figure 7

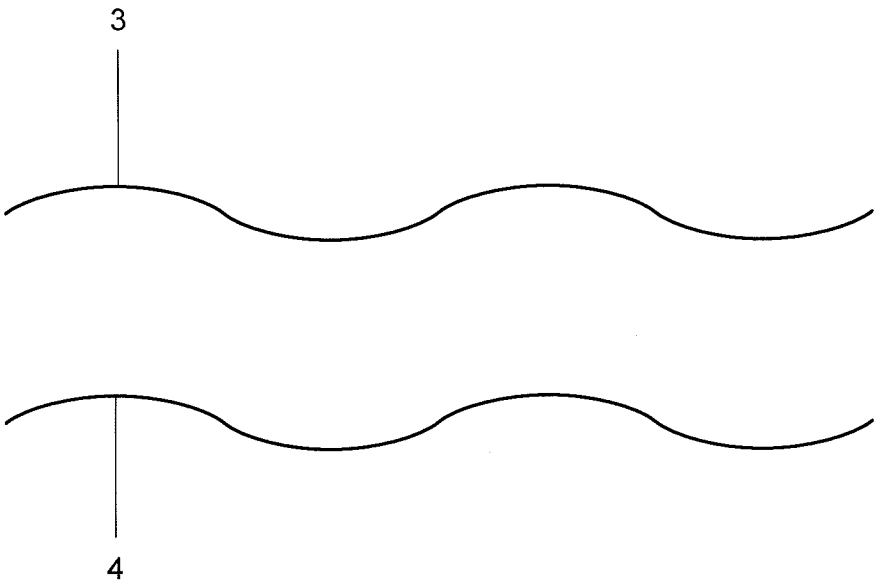

Figure 8

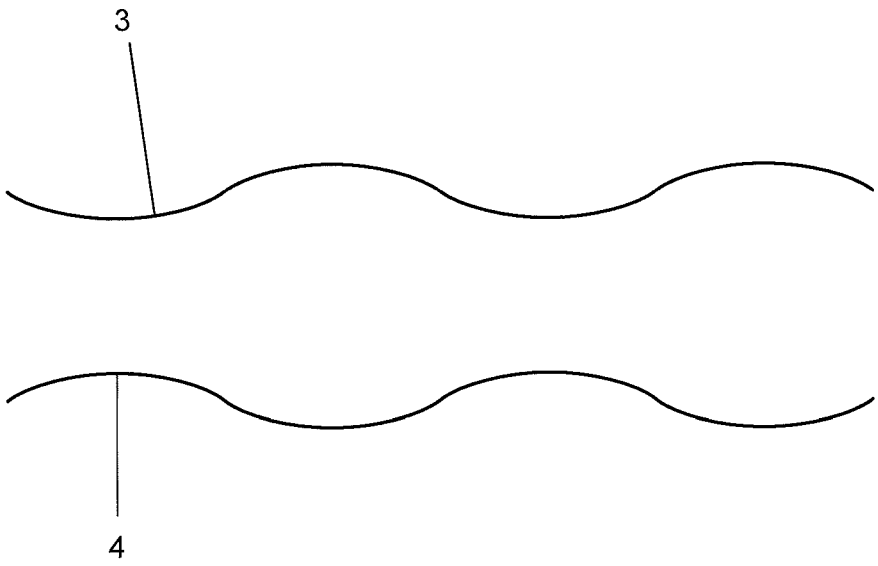

Figure 8A

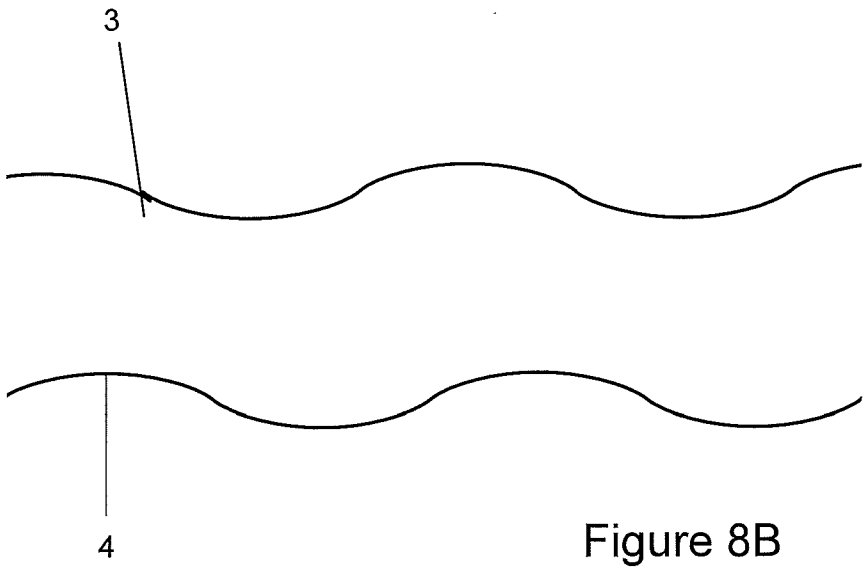

Figure 8B

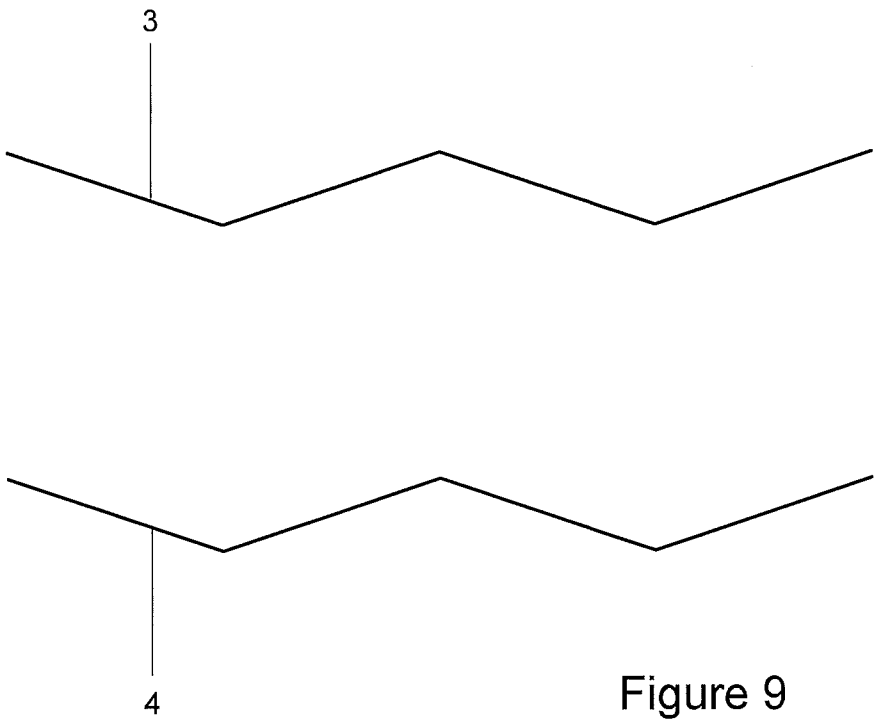

Figure 9

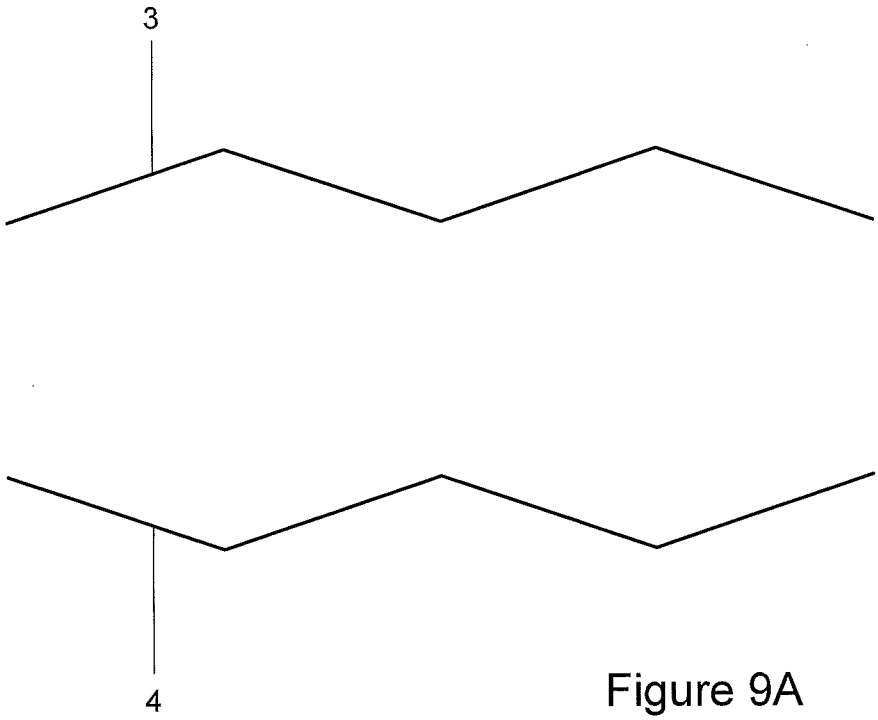

Figure 9A

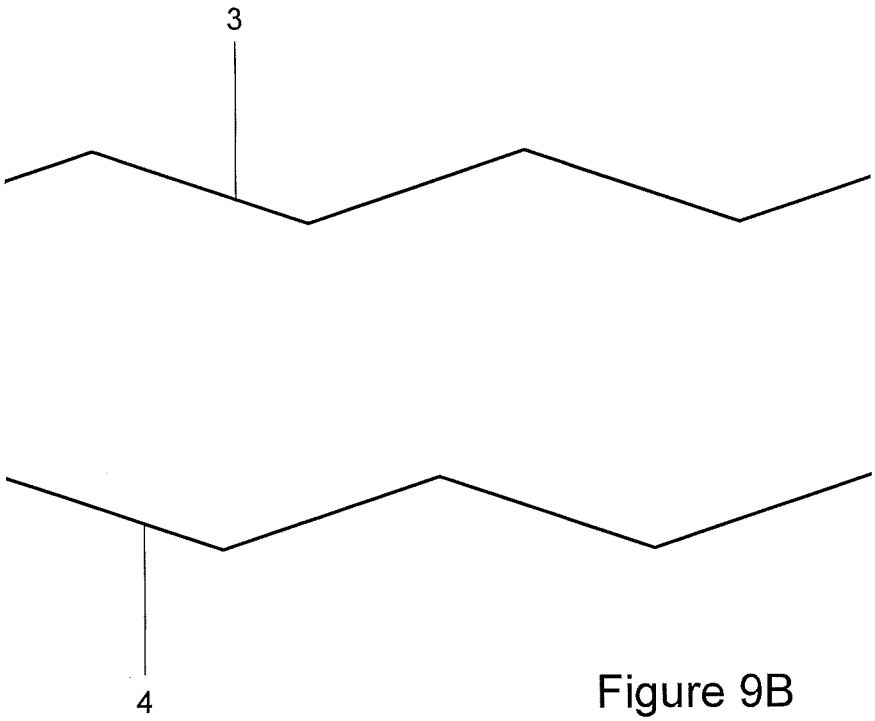

Figure 9B

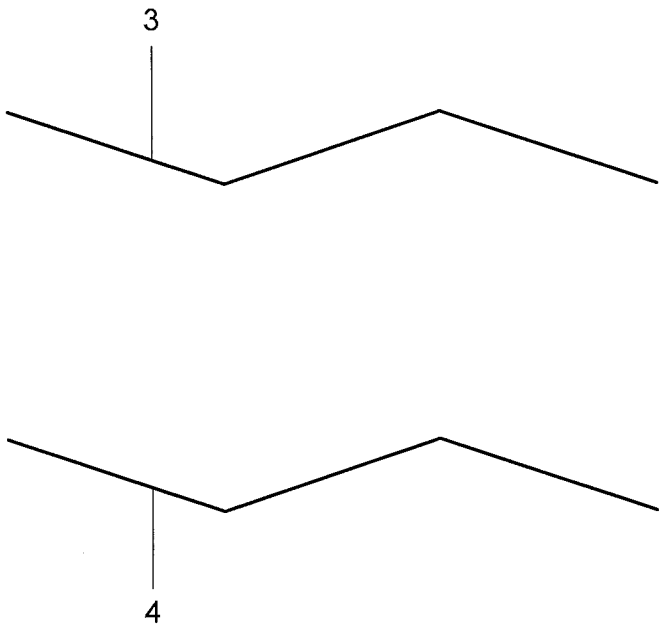

Figure 10

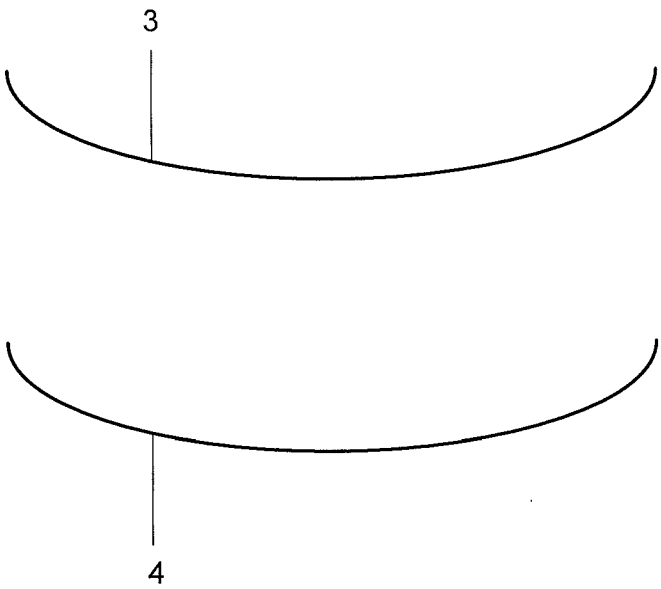

Figure 11

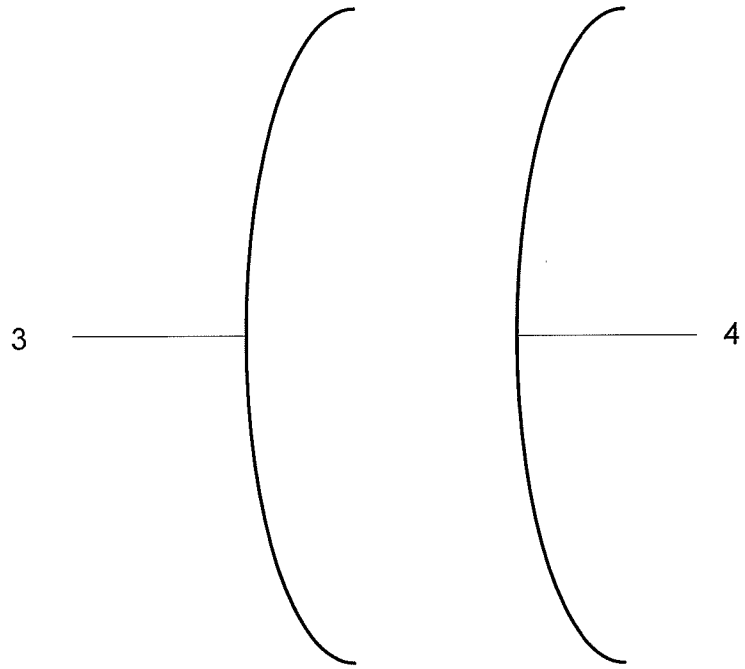

Figure 12

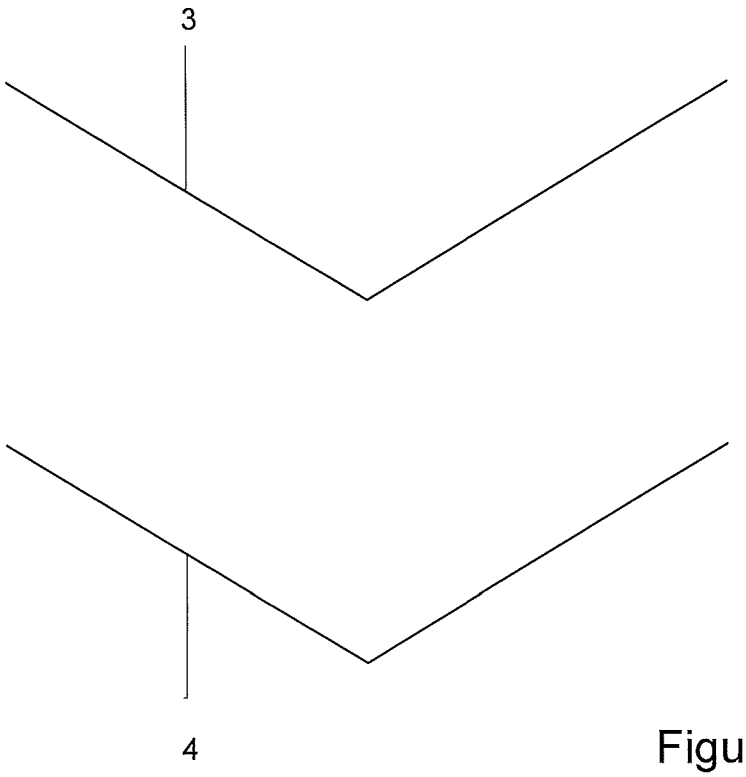

Figure 13

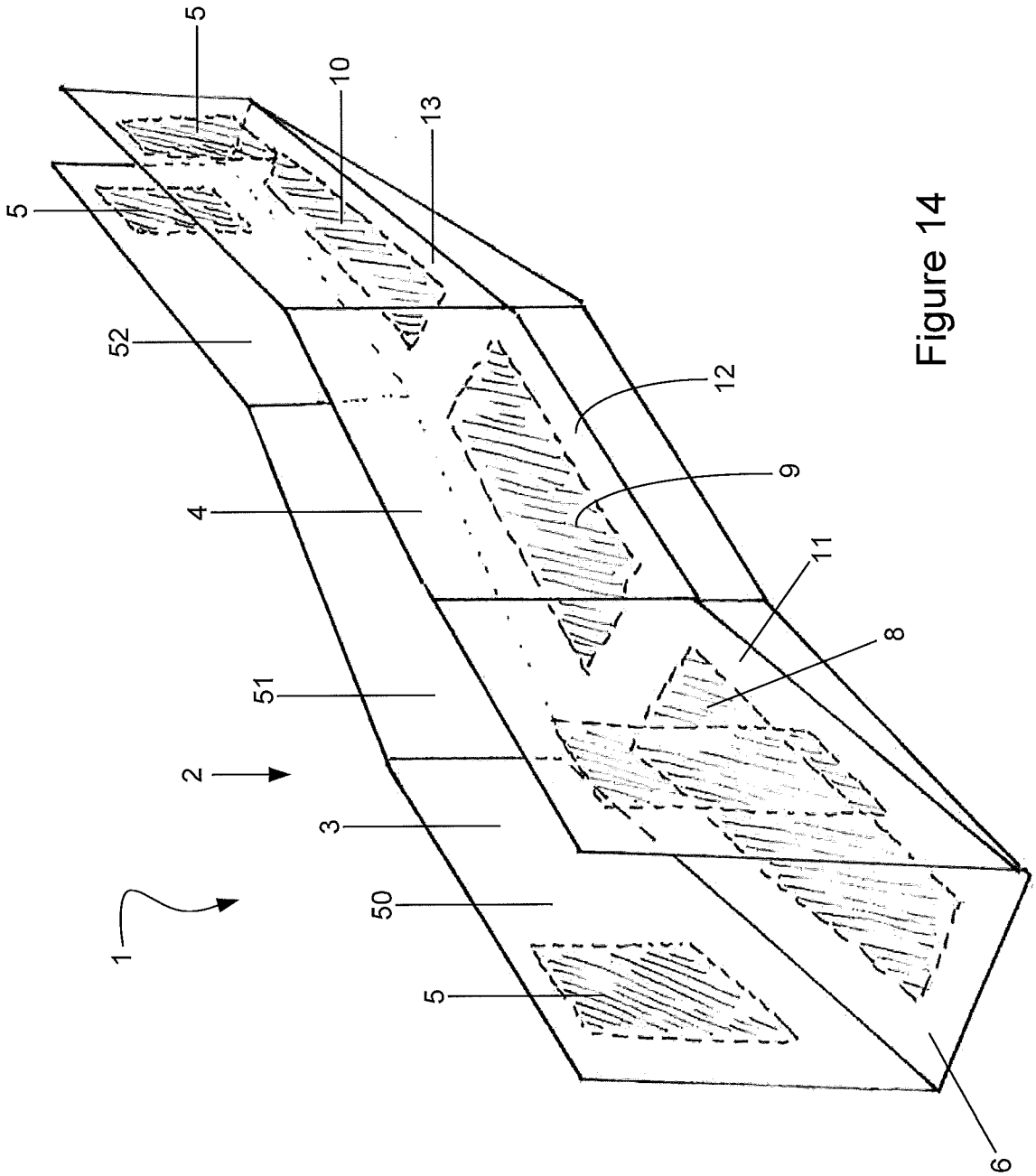

Figure 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2015/050208

A. CLASSIFICATION OF SUBJECT MATTER

A01K 11/00 (2006.01) A01K 1/00 (2006.01)

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)

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 practicable, search terms used)

EPODOC, WPIAP: CPC - A01K1/0005/LOW, A01K1/0613, Y10S119/908, A01K11 and keywords (identification, eid, antenna, sensor, receiver, floor, race, slope, ramp, chute and like terms); Applicant/Inventor Search (BENJAMIN WILINKSON, BRAIN CLAYTON, FRANK FINLAYSON, PATRICK GUNSTON)

Google Patents: elevated race with a ramp for scanning livestock tag, elevated race for scanning livestock tag, scanners for livestock tags embedded in ramps, under floor scanner for identification tags for livestock race, under floor scanner for identification tags for livestock, herding animals closer to electronic tag reading devices, guiding animals closer to electronic tag reading devices, improving electronic tag reading in animal enclosure, improving EID tag reading in animal enclosure

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

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

"E" earlier application or patent 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	Date of mailing of the international search report
16 June 2015	16 June 2015
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	Darcy Corbett AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0262832212

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2015/050208

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

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

1. ☐ Claims Nos.:

because they relate to subject matter not required to be searched by this Authority, namely:

the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including

2. ☐ Claims Nos.:

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

3. ☐ Claims Nos:

because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

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

See Supplemental Box for Details

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

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

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/AU2015/050208**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/0123811 A1 (BONSALL) 01 July 2004 Paragraph [0099], Figures	1, 2, 4, 33, 34, 36-39
X Y	EP 2497357 A1 (MCGILLIVRAY) 12 September 2012 Paragraph [0014], Figures Paragraph [0014], Figures	1, 2, 4, 32-39 9-11, 13-22
X Y	WO 2008/008031 A1 (DELAVAL HOLDING AB) 17 January 2008 Page 9 lines 25-34, page 13 lines 10-22, Figures 1, 3 Page 9 lines 25-34, page 13 lines 10-22, Figures 1, 3	5-8, 33-39 9-11, 13
X Y	US 6318289 B1 (PRATT) 20 November 2001 Col. 11 lines 14-40, Col. 31 line 62 - Col. 32 line 7, Figures Col. 11 lines 14-40, Col. 31 line 62 - Col. 32 line 7, Figures	23-31, 33-39 14-22
X	DE 10137470 C1 (BAYERISCHE LANDESANSTALT FUR LANDTECHNIK DER TECHNISCHEN UNIVERSITAT MUNCHEN) 02 January 2003 Abstract, Figures	32-37, 39
A	US 2011/0155064 A1 (DE VILLIERS) 30 June 2011	

Supplemental Box

Continuation of: **Box III**

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

This Authority has found that there are different inventions based on the following features that separate the claims into distinct groups:

- Claims 1-4, 14-22 (in part), 33-39 (in part) are directed to an animal identification system which includes a race, a floor section which defines a height change, and electronic animal identification devices which, in use, are brought closer to identification readers as the animals move through the height change.. The feature of the floor defining a height change, and the use of the height change to bring animals identification devices closer to the readers is specific to this group of claims.

- Claims 5-13, 14-22 (in part), 33-39 (in part) are directed to an animal identification system which includes a race, electronic animal identification devices which, in use, are brought closer to identification readers as the animals move through the race in a non-linear fashion.. The feature of a race which causes animals to move in a non-linear fashion, and the non-linear movement of the animals bringing their identification devices closer to the electronic readers is specific to this group of claims.

- Claims 23-31, 33-39 (in part) are directed to an animal identification system which includes a race, the walls of the race including one or more undulations, and electronic identification devices which are positioned to be read by identification readers as the animals pass along the path.. The feature of the race having walls which define one or more undulations is specific to this group of claims.

- Claims 32, 33-39 (in part) are directed to an animal identification system which includes a race, the walls of the race including one or more angled wall portions, and electronic identification devices which are positioned to be read by identification readers, which are mounted on the angled wall portion at an acute angle to the path, as the animals pass along the path.. The feature of the walls of the race including at least one angled wall portion, and the reader being mounted on the wall portion at an acute angle to the path is specific to this group of claims.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship. The only feature common to all of the claimed inventions and which provides a technical relationship among them is an animal identification system which includes a race and identification readers positioned to read electronic identification devices borne by the animals which pass along the race.

However this feature does not make a contribution over the prior art because it is disclosed in:
D1: US 2004/0123811 A1 (BONSALL) 1 July 2004 (See race ((30), (70), (72)) and electronic animal identification device and reader ((200), (202)))

Therefore in the light of this document this common feature cannot be a special technical feature. Therefore there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied *a posteriori*.

Supplemental Box

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2015/050208**

This Annex lists known 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/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
US 2004/0123811 A1	01 July 2004	US 7028638 B2	18 Apr 2006
		CA 2363455 A1	20 May 2002
		CA 2364724 A1	08 Feb 2003
		CA 2463990 A1	18 May 2005
		US 6439825 B1	27 Aug 2002
		US 2002061246 A1	23 May 2002
		US 6537016 B2	25 Mar 2003
		US 2003007854 A1	09 Jan 2003
		US 6913432 B2	05 Jul 2005
		US 2003123967 A1	03 Jul 2003
EP 2497357 A1	12 September 2012	AU 2012201323 A1	20 Sep 2012
		AU 2012201323 B2	20 Nov 2014
		NZ 598566 A	31 May 2013
WO 2008/008031 A1	17 January 2008	EP 2037732 A1	25 Mar 2009
US 6318289 B1	20 November 2001	AU 690741 B2	30 Apr 1998
		AU 727101 B2	30 Nov 2000
		AU 2476801 A	12 Jul 2001
		AU 775809 B2	19 Aug 2004
		AU 3457095 A	09 May 1996
		AU 7868898 A	01 Oct 1998
		AU 2004205259 A1	23 Sep 2004
		AU 2004205259 B2	12 Jun 2008
		CA 2161749 A1	01 May 1996
		CA 2627835 A1	01 May 1996
		CA 2719886 A1	01 May 1996
		US 5573002 A	12 Nov 1996
		US 5673647 A	07 Oct 1997
		US 5836880 A	17 Nov 1998
		US 6000361 A	14 Dec 1999
		US 6135055 A	24 Oct 2000
		US 6200210 B1	13 Mar 2001
		US 2002050248 A1	02 May 2002
		US 6516746 B2	11 Feb 2003
		US 2001044579 A1	22 Nov 2001

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2015/050208**

This Annex lists known 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/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		US 6579236 B2	17 Jun 2003
		US 2003188689 A1	09 Oct 2003
		US 6805075 B2	19 Oct 2004
		US 2005000458 A1	06 Jan 2005
		US 7347161 B2	25 Mar 2008
		US 2007131175 A1	14 Jun 2007
		US 7464666 B2	16 Dec 2008
		US 2007157888 A1	12 Jul 2007
		US 7464667 B2	16 Dec 2008
		US 2008190369 A1	14 Aug 2008
		US 7607405 B2	27 Oct 2009
		US 2008270173 A1	30 Oct 2008
		US 7726258 B2	01 Jun 2010
		US 2009307111 A1	10 Dec 2009
		US 7748345 B2	06 Jul 2010
		US 2009031960 A1	05 Feb 2009
		US 7827934 B2	09 Nov 2010
		US 2009031961 A1	05 Feb 2009
		US 7836849 B2	23 Nov 2010
		US 2011161125 A1	30 Jun 2011
		US 8028657 B2	04 Oct 2011
		US 2012158463 A1	21 Jun 2012
		US 8261694 B2	11 Sep 2012
		US 2013151310 A1	13 Jun 2013
		US 8474405 B1	02 Jul 2013
DE 10137470 C1	02 January 2003		
US 2011/0155064 A1	30 June 2011	US 8397669 B2	19 Mar 2013
		AU 2009286871 A1	04 Mar 2010
		AU 2009286871 B2	03 Oct 2013
		NZ 590588 A	28 Jun 2013
		WO 2010023056 A1	04 Mar 2010

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.