

(19)



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(11) Publication number:

**0 518 437 A1**

(12)

**EUROPEAN PATENT APPLICATION**(21) Application number: **92201671.2**(51) Int. Cl.<sup>5</sup>: **A61D 17/00, A01K 29/00**(22) Date of filing: **09.06.92**(30) Priority: **10.06.91 NL 9100994**(43) Date of publication of application:  
**16.12.92 Bulletin 92/51**(84) Designated Contracting States:  
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**NL-2587 BN 's-Gravenhage(NL)**(54) **Birth alarm for livestock.**

(57) A wireless birth alarm for livestock, such as mares, cows or ewes, comprising position sensing and signal emitting means to be secured to the animal, which means close a contact and emit a signal when the animal takes up a position that may be characteristic of the onset of parturition for that animal, as well as a signal receiver comprising a circuit which, upon receiving an uninterrupted signal, after a settable threshold interval has elapsed, can activate an alarm, wherein at the receiver the circuit can be set in a position where the alarm is only activated if the continuously received signal is interrupted for a period of time the length of which depends on the animal species and then resets again.

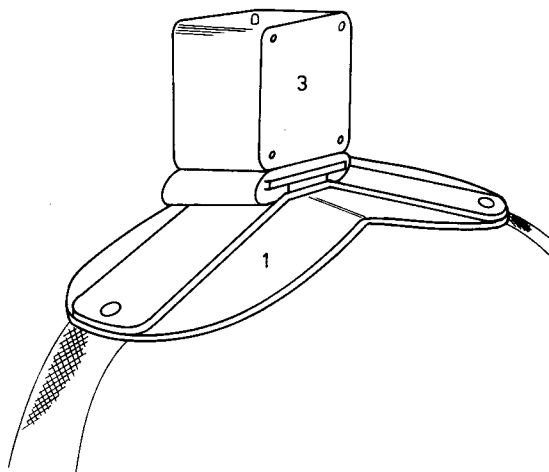


FIG.1

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This invention relates to a wireless birth alarm for livestock, such as mares, cows or ewes, comprising position sensing and signal emitting means to be secured to the animal, which means close a contact and emit a signal when the animal takes up a position that may be characteristic of the onset of parturition for that animal, as well as a signal receiver comprising a circuit which, upon receiving an uninterrupted signal, after a settable threshold interval has elapsed, can activate an alarm.

Such birth alarms are described in applicants' older NL patent application No. 9000528 and also in WO 82/00952 (PARK).

In the known birth alarms, which are based on signalling the position of the animal during parturition, it is assumed that, for example, horses in most cases either sleep standing up or sleep in a semi-erect lying position with the head virtually straight up. This means that in the known birth alarms a contact of the position sensing means is closed and a signal is emitted as soon as the animal takes up a lying position, and to avoid false alarm in the event of incidental motions such as running, rolling and the like, which causes the contacts to be closed for a short time, a threshold interval is built into the receiver, which interval must elapse before the alarm goes off at all.

Although this manner of signalling is already much more animal-friendly and more universally applicable than other conventional signalling techniques, in which sensors are used which are responsive to the humidity of the skin or are attached to the vulva of a mare and can be operated by the birth sack, an important disadvantage is inherent to the known birth alarms. The fact is there are a substantial number of animals that do tend to sleep in a lying position, at any rate in the period before parturition.

These cases are provided for by the birth alarm according to the present invention, in which at the receiver the circuit can be set in a position where the alarm is only activated if the continuously received signal is interrupted for a period of time the length of which depends on the animal species and then resets again.

The invention is based on the principle that in the case of a contraction a lying sleeping animal tenses during the contraction while partly raising herself. In horses, a contraction lasts about 90 seconds on average and the birth alarm thus signals the occurrence of contractions.

In the case of animals that tend not to sleep in a lying position, the receiver can be set in a position which signals as soon as the animal lies down. If it turns out the lying position is not connected with the onset of labour, the circuit can be switched to the position that signals contractions.

In further elaboration of the invention, to con-

serve the power source (battery) of the transmitter, the position sensing and signal emitting means can be automatically deactivated after elapse of a settable transmission time of for instance 3 minutes and, after a temporary interruption of contact in the sensing means, when the contact is closed again, be reactivated after a very short lapse of time of the order of one second.

According to the invention, to guarantee that the detection of any changes in the position is exact and the position sensing and signal emitting means remain in place, in the case of horses, the position sensing and signal emitting means, comprising liquid switches such as mercury switches, can be embedded and be confined in a protective casing which can be attached between the withers of a horse by coupling it to the projecting bracket of an anti-roll girth positioned behind the forelegs of a horse.

According to the invention, in the case of sheep, the position sensing and signal emitting means can be attached behind the head of the sheep through coupling to the buckle of a girth positioned behind the forelegs of a sheep, this girth being fitted with a girth plate provided with Velcro at the underside thereof for adherence to the fleece.

In the category of cows that calve standing up, the position of the back is characteristic inasmuch as during parturition, as well as during urination, the back is curved, while normally it is straight and horizontal. By adding to the liquid switches, which are mounted on the withers of the cow via an anti-roll girth and can signal a lying (parturient) position, a switch that signals longitudinal curving of the back, the cow's taking up a position indicative of either calving or urination is signalled. By further setting the threshold interval in the receiver at a value which is greater than the normal urinating time of a cow (of the order of 14 seconds), false alarm in the event of urination is precluded.

According to the invention, therefore, for cows of the category that tend to give birth standing up, the position sensing and signal emitting means, comprising liquid switches, such as mercury switches, which signal the cow's taking up a lying position and further comprising a switch which signals the curving of the back in longitudinal direction, can be embedded and be confined in a protective casing which can be attached to the withers of the cow by coupling it to the buckle of a girth.

To prevent the anti-roll girth from shifting forward, according to the invention, use can be made of a tail strap which can be positioned around the tail and which on the back splits into two parts which are secured laterally to the girth. During parturition, when the cow curves her back, the lateral parts of the tail strap pull the lateral parts of

the girth rearwardly, so that the change of inclination when the back is curved is further enhanced and the longitudinal switch can function more reliably.

To clarify the invention, some embodiments of the birth alarm will now be described, by way of example, with reference to the accompanying drawings.

In principle, the operation of the birth alarm is as follows. When for the actual birth the mother animal lies down during the contractions and starts to push, the angle of the animal's lying position is different from the angle of its normal rest position. The meridian line (Fig. 5, no. 1) through the body of a mare, cow or ewe that is standing up, lying normally or walking, makes an angle of 90° (Fig. 5) to about 65° (Fig. 7) relative to the ground. During the contractions, the angle of a mother animal in labour is from about 2° (Fig. 6) to about 40° relative to the ground, depending on the animal species. Now, when two mercury switches are attached to the back of the mother animal in such a manner that they make contact to the right or to the left at an angle that is characteristic for the animal species in question, such contact can be passed on as a signal to the receiver via a transmitter.

The receiver is so constructed that it can be switched to two positions: Position 1 is for mother animals (i.e. 90% of the mother animals) who, before parturition, tend not to rest or sleep in stretched position, i.e., at an angle smaller than 40°. When, in the case of this category of animals, the receiver receives signals from the transmitter, the alarm will not be set off until a so-called threshold interval, characteristic of the animal species in question, has elapsed. This prevents the occurrence of false alarm as a result of running or rolling motions of the mother animal.

Now, when the alarm is actuated by a mother animal resting or sleeping in stretched position, position II of the receiver must be switched on by means of a knob. The transmitter is so designed that, for instance in the case of mares resting in stretched position, it does not transmit for a period longer than about three minutes. A circuit provides that the transmitter then switches off automatically but remains standby without appreciable power consumption. When the contact is broken, i.e., when the mother animal rises again, the transmitter will reset in about one second and again be capable of transmitting continuously for three minutes, if necessary.

The receiver in position II operates as follows. When a horizontally resting mother animal wakes up and contractions start, the transmitter will reset because the mother animal raises herself between contractions and the mercury contact will be

broken. The receiver has been set in such a manner that it only sets off the alarm if it receives a signal for a period of time longer than the animal-specific threshold interval and this signal is interrupted for a minimum time span, for instance one second. This interruption, however, must occur before a predetermined maximum interval, for instance of 90 seconds, has elapsed. If the receiver receives a signal continuously for a period longer than the predetermined interval (for instance 90 seconds), the alarm is not set off and the receiver regards the signal as coming from a horizontally resting animal. An interruption of one second of the transmitted signal (i.e., for a short time no transmission takes place) between threshold interval (for instance three seconds) and the set maximum transmitted signal interval (for instance 90 seconds), registered by the receiver, results in an actual alarm signal produced by the receiver. A disadvantage of position II is that a small percentage of false alarms will occur in the case of mother animals that are sleeping in stretched position and are restless. The number involved here, however, is quite acceptable.

Essential is the combination of the following characteristics of the wireless birth alarm:

- Mercury switches of sufficient length having a small contact angle.
- The angle which the two mercury switches make relative to the meridian line of the mother animal. The angle is specific for each animal species.
- The maximum and minimum threshold intervals which are built into the receiver and which are specific for each animal species.
- Safe installation of the mercury switches, i.e., embedded in a buffer of insulating, shock-absorbing material, for instance polyurethane foam (Fig. 4, no. 3).
- The embedded mercury switch (Fig. 4, no. 3), the antenna (Fig. 4, no. 4), the battery (Fig. 4, no. 5) and the transmitter (Fig. 4, no. 2) are mounted in a plastics casing (Fig. 4, no. 1).
- A LED is arranged on the casing for monitoring the operation of the transmitter.
- The entire transmitter section (Fig. 3, no. 3) is mounted in a simple manner in a plastics holder (Fig. 3, no. 1) designed especially for this purpose.
- In the case of mares and cows, the assembly can be mounted universally on the most commonly used anti-roll girths (Fig. 3, no. 2) and as such cannot be damaged by the mother animal. For sheep, a special girth (Fig. 1) has been developed for this purpose. By widening the top side of the girth by means of an oval plastics 4 mm plate (Fig. 1,

no. 1), the transmitter (Fig. 1, no. 3) can be mounted thereon and by providing so-called Velcro under this plastic plate, the girth will remain exactly in place owing to the adherence of the Velcro to the wool of the sheep.

- As regards the transmitter, the automatic switch-off is of crucial importance. The transmitter is fitted with a circuit which provides that the maximum consecutive transmission time is three minutes. This occurs when the mercury switch makes contact constantly for three minutes. After these three minutes, the transmitter switches off automatically and remains standby, i.e., the circuit referred to also provides that the transmitter is switched on again when the mercury circuit is interrupted for more than one second. The circuit referred to prevents exhaustion of the battery in the case of animals that rest in stretched position. The circuit is so designed that the battery which supplies the transmitter with energy can keep the transmitter standby for over two months without being exhausted.

Figs 8 and 9 show a cow having a straight and a curved back, respectively. The transmitter 3 comprises, in addition to the two transversely slanting mercury switches sensing the lying positions of the cow, a third mercury switch which is arranged in the longitudinal direction and which accordingly measures the changes in the inclination of the back. This last-mentioned switch, therefore, senses a change in position indicative of either calving or urination. The average urination time of a cow is of the order of 14 seconds and therefore a corresponding threshold interval must be set in the receiver so as to prevent false alarm. Figs 8 and 9 further show a tail strap 5 which splits into two lateral parts 5a connecting laterally to the girth 2.

## Claims

1. A wireless birth alarm for livestock, such as mares, cows or ewes, comprising position sensing and signal emitting means to be secured to the animal, which means close a contact and emit a signal when the animal takes up a position that may be characteristic of the onset of parturition for that animal, as well as a signal receiver comprising a circuit which, upon receiving an uninterrupted signal, after a settable threshold interval has elapsed, can activate an alarm, characterized in that at the receiver the circuit can be set in a position where the alarm is only activated if the continuously received signal is interrupted for a period of time the length of which depends on the animal species and then resets again.

2. A birth alarm as claimed in claim 1, characterized in that for horses that tend to sleep lying down, said period of interruption is 6-120 seconds.

3. A birth alarm as claimed in claim 1 or 2, characterized in that the position sensing and signal emitting means are automatically deactivated after a settable transmission time of for instance 3 minutes, and, after a temporary break of contact in the sensing means, when the contact is closed again, are reactivated after a very short lapse of time of the order of 1 second.

4. A birth alarm as claimed in any one of the preceding claims, characterized in that, with horses, the position sensing and signal emitting means comprising liquid switches such as mercury switches are embedded and are confined in a protective casing, which casing can be attached between the withers of a horse by coupling to the projecting bracket of an anti-roll girth which is positioned behind the forelegs of a horse.

5. A birth alarm as claimed in any one of claims 1-3, characterized in that, with sheep, the position sensing and signal emitting means comprising liquid switches such as mercury switches are embedded and are confined in a protective casing, which casing can be attached behind the head of a sheep by coupling to the buckle of a girth which is positioned behind the forelegs of a sheep, said girth comprising a girth plate fitted with Velcro for adherence to the fleece.

6. A birth alarm as claimed in any one of claims 1-3, characterized in that, with cows tending to giving birth standing up, the position sensing and signal emitting means comprising liquid switches such as mercury switches, which signal the cow's taking up a lying position and further comprising a switch signalling the curving of the back in longitudinal direction, are embedded and are confined in a protective casing, which casing can be attached to the withers of the cow by coupling to the buckle of a girth.

7. A birth alarm as claimed in claim 6, characterized by a tail strap which can be positioned about the tail and which on the back splits into two parts which are laterally attached to the girth.

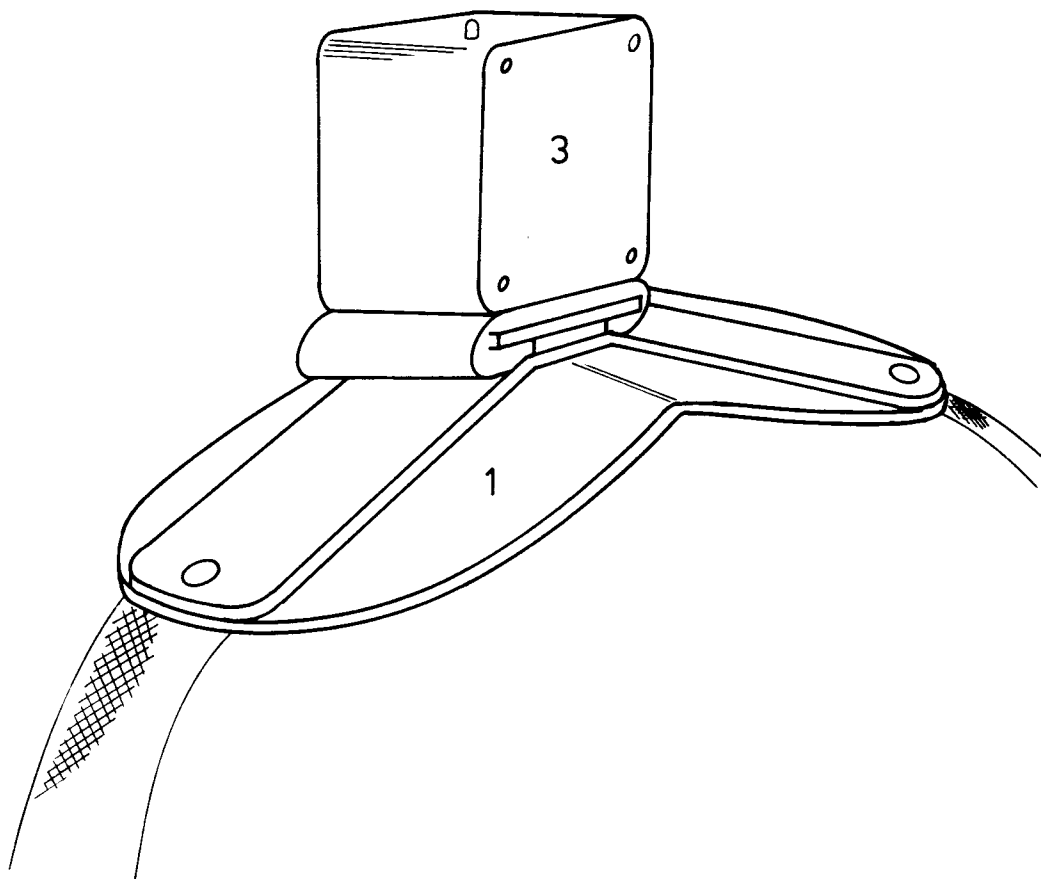


FIG.1

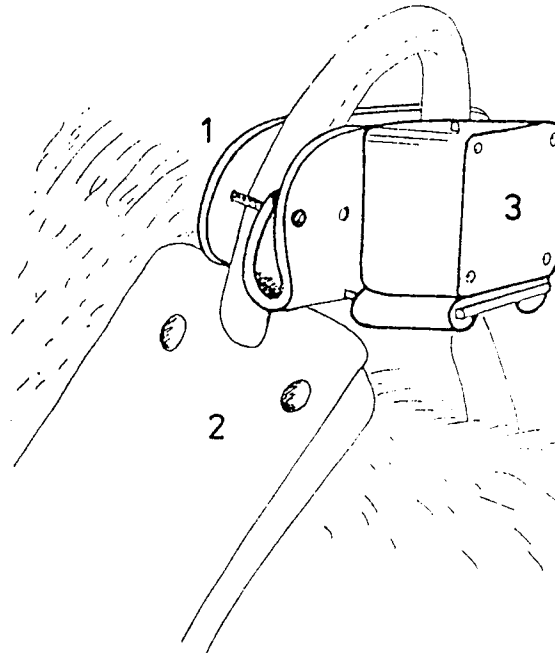


FIG. 3

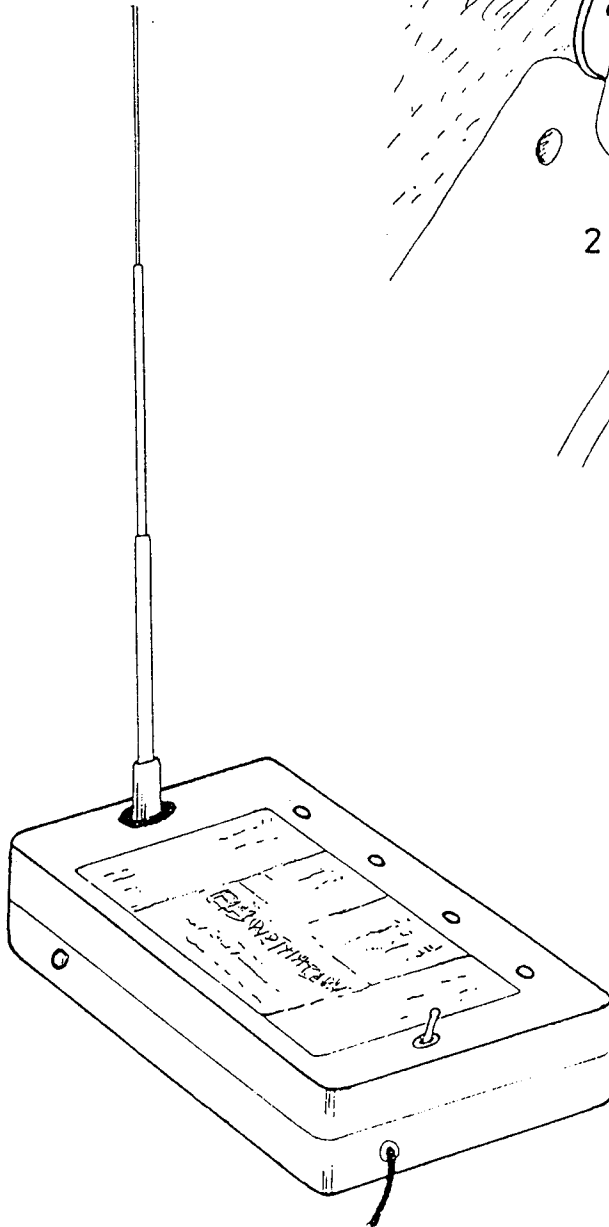


FIG. 2

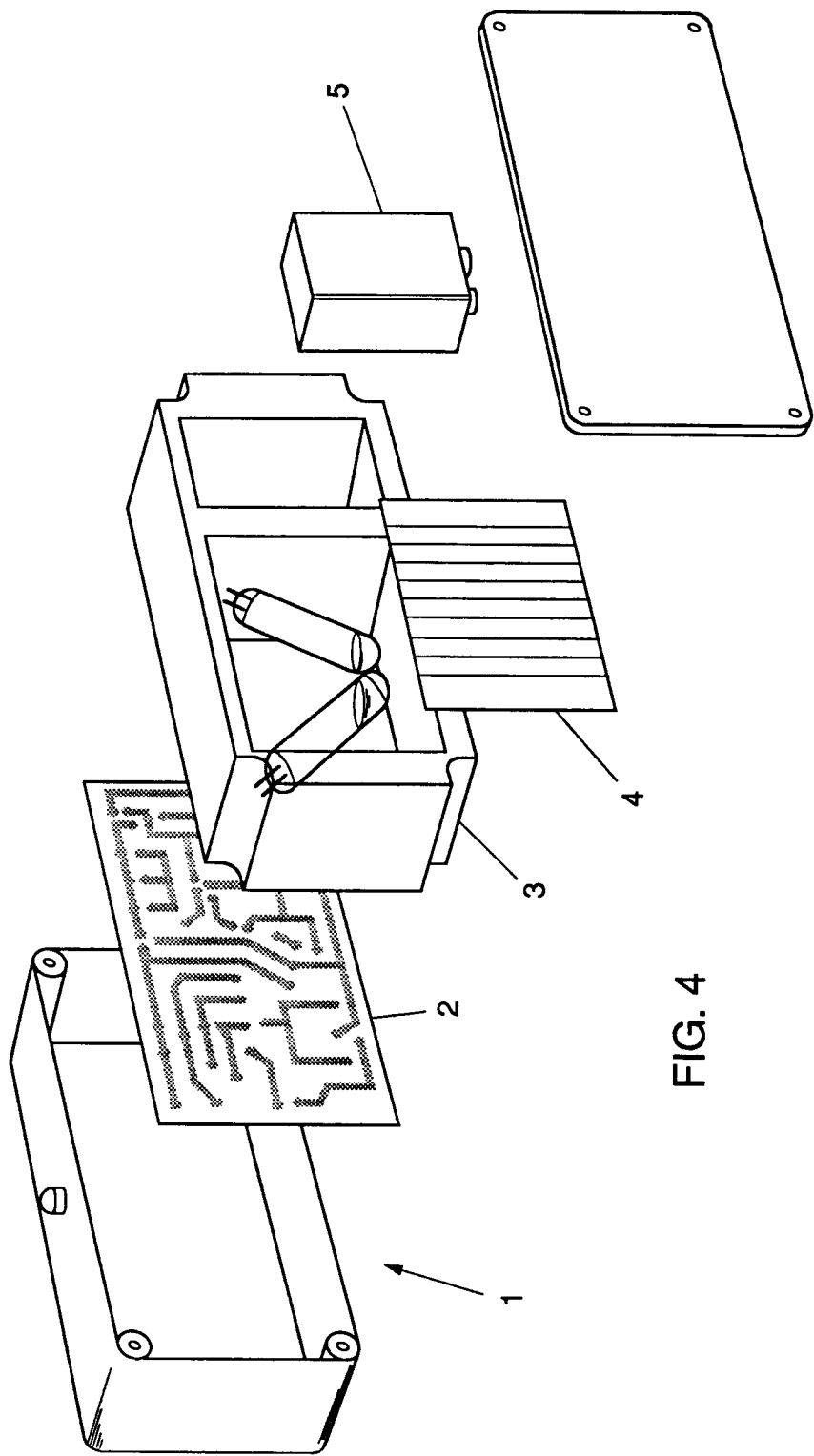


FIG. 4

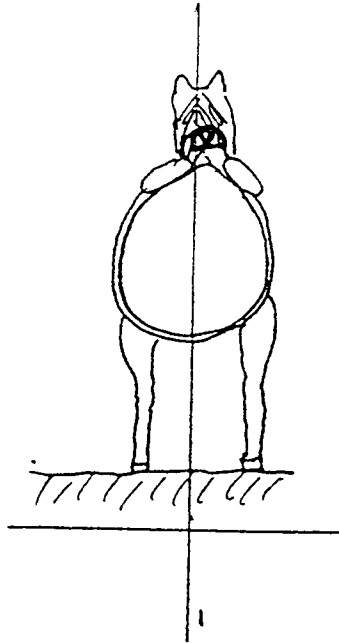


FIG. 5

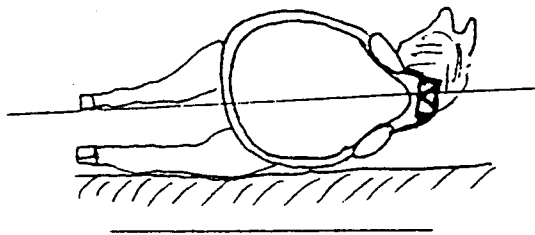


FIG. 6

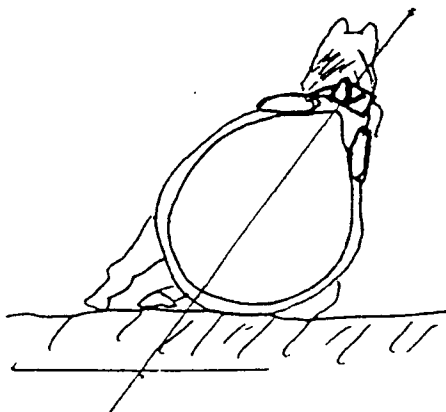


FIG. 7



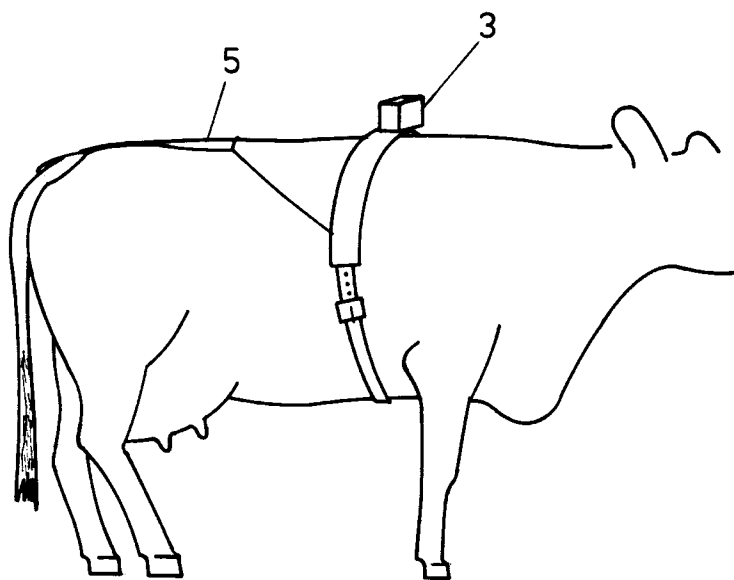


FIG. 8

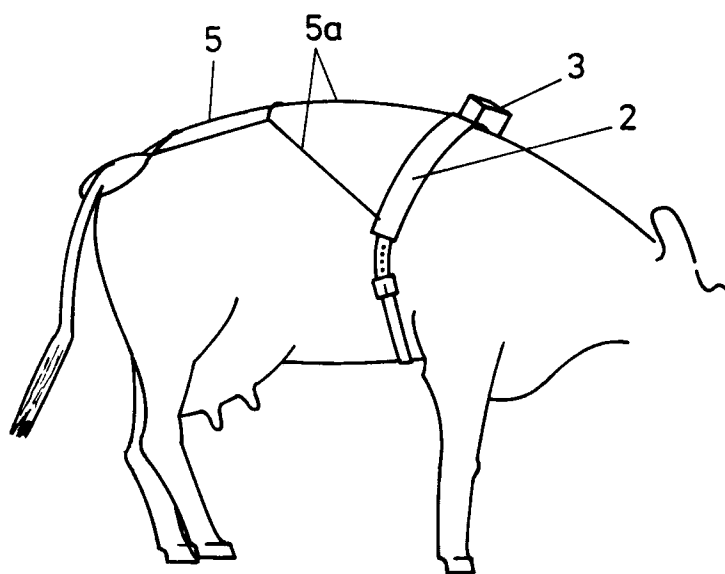


FIG. 9



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## EUROPEAN SEARCH REPORT

Application Number

EP 92 20 1671

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D,A	WO-A-8 200 952 (PARK) * the whole document * ---	1	A61D17/00 A01K29/00
A	US-A-4 055 839 (SKEGGS) * the whole document * ---	1	
A	GB-A-2 221 161 (CARR) * page 5, line 23 - page 7, line 1; figures 2,3 * -----	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A61D A01K
Place of search THE HAGUE		Date of completion of the search 30 SEPTEMBER 1992	Examiner VANRUNXT J.
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