Title: METHOD AND ARRANGEMENT FOR CONTROLLING THE TEMPERATURE IN AN AREA OF AN ANIMAL STABLE

Abstract: A method and an arrangement for controlling the temperature in an area (1) of an animal stable is disclosed, where the heat supply is controlled in dependence of a temperature registration in the area. The arrangement includes a heating lamp (2) connected with an automatic control (3) and an infrared heat measuring device (5). The automatic control (3) and the heating lamp are powered via existing 230V installation (4). The automatic control (3) is arranged for regulating the power supply to the heating lamp (2), or to switch it off completely. The temperature is regulated to a level (6) receeding as time goes by as the heat demand of the piglet diminishes.
Method and Arrangement for Controlling the Temperature
in an Area of an Animal Stable

Background of the Invention

The present invention concerns a method and an arrangement for controlling the temperature in an area of an animal stable where heat supply is controlled in dependence of a temperature registration in the area.

The invention may find application on different animals having a special stable area in which they grow, and where need for heat, specifically temperature, is thus only present when the animals are in the area. This specific temperature may be achieved by cooling as well as by heating.

The invention will, however, be particularly explained in connection with heat boxes or nests for piglets in a farrowing stable and in connection with the special thermal conditions valid for piglets in their first four to five weeks of living. However, there is possibility of using the inventive idea for other animals and within other areas of application, as e.g. of behaviour control.

In piglet nests, there is commonly provided a heating lamp. The heating lamp has the purpose of regulating the temperature in a small area of the farrowing stable. The area is that which the light circle from a heating lamp is covering. Within the light circle there may lie a varying number of piglets. Other heaters may be used, e.g. electric plates or plates/pipes conducting hot water.

The prior art systems may be designed with thermostatic controls in order to ensure a uniform temperature level in the area. These are, however, connected with drawbacks, since a constant heat supply is continually maintained in the area irrespectively of the need therefor. Furthermore, regulation of the temperature to the desired level will occur in dependence of a measurement of the air temperature in the area. Thus, some unnecessary energy may be used when the temperature is very low and when the animals are not within the area, and vice versa. As a result of the wrong surface tempera-
ture, the piglets are using energy on heat-seeking or cold-seeking behaviour instead of feed-seeking behaviour. A behaviour resulting in a body weight gain less than otherwise attainable.

It is the purpose of the invention to indicate a new system that relieves these drawbacks, reduces the risk of overlying and enables the provision of an energy economic system for heating the stable area and for increasing body weight gain measured in kg and for reducing mortality.

According to the present invention, this is achieved with a method being peculiar in that the temperature registration is used for regulating the temperature to a desired predetermined level by registering a temperature within a predetermined range around the predetermined level, that the temperature registration is used for reducing/interrupting the heat supply at the registration of a temperature under the predetermined range, and that the heat supply is connected at the registration of a temperature within the range.

The arrangement according to the invention is peculiar in that the arrangement includes controllable heaters that are connected with a temperature measuring device arranged for measuring a temperature in areas, preferably the temperature of the animal bodies, and an automatic control arranged for regulating the heaters in order to keep the temperature at a desired predetermined level at the registration of a temperature within a predetermined range around the predetermined level, and for regulating the heaters when registering a temperature below the predetermined range.

With such a method and such an arrangement it may be ensured that heat supply is only effected when a temperature within a certain range is registered. If registration of a temperature below this range occurs, it will be possible to reduce or interrupt the heat supply instead of consuming energy by continuously supplying heat. Furthermore, correct surface temperature on the animals is achieved when they are in the area so that body weight gain may be optimised.
It can be possible to reduce the heat supply to the heaters and still maintain a minimal energy consuming light in the area. This is particularly simple to establish if the heaters includes a heating lamp. By maintaining light, the piglets are attracted to the area. Possibly, this occurs with a flashing sequence attracting the piglets to the area so that the heat-seeking behaviour is utilised. By the system according to the invention, the animal will use less energy for heat-seeking, and therefore an advantageous increase in the body weight gain is attained.

Overlying is reduced by the piglets being more attracted to the light/heat in their heat-seeking behaviour than attracted to the sow. This means that the system according to the invention is particularly advantageous as it enables farrowing stables with loose sows and reduced risk of overlying.

Temperature registration occurs preferably by registering the surface temperature of the animal bodies, and particularly by infrared temperature measurement. Thus the heat supply may be reduced/interrupted when the animals have left the area. Thus there may be effected regulation in order to keep the temperature constant.

According to a possible embodiment, the automatic control increases the energy supply to a given level at registration of falling temperature. Then the power supply will immediately be switched off or much reduced for just maintaining light in the area.

The finished arrangement is preferably to be designed so that it is installation friendly, i.e. mounting and installing is preferably to be performed by the user. According to an embodiment, the heaters include a heating lamp, and the temperature measuring device includes an infrared temperature measuring device. The automatic control is to be supplied with 230 V so that usual installations are sufficient for powering the arrangement, and so that the automatic control may be inserted in an existing installation.

The arrangement, including automatic control and associated components, is to function in a stable with dust and ammonia vapours. Therefore, it is preferred that the ar-
rangement fulfils requirements for IP 55 and is made with components of stainless and/or acid-proof materials.

Piglets’ need for additional heat changes during the first 4-5 weeks of the pig’s life. The need is characterised by falling from a surface temperature of about 38°C to about 34°C, or even down to about 29°C.

On feedback from the infrared temperature measuring device, the light intensity in the heating lamp is to be regulated so that the desired temperature level, determined according to the actual age for the piglets, is attained.

If the pigs withdraw, or are not present within the area for other reasons, the lamp is to be switched off or reduced in light intensity, respectively. This occurs preferably by registering a temperature deviating more than 5°C below the said temperature level. Other limits, e.g. down to 0.1°C, for the range are possible.

If the pigs come into the area under the lamp, this is registered by the temperature measuring device. This registration is to provide that the automatic control is to start/regulate the heat supply until the desired temperature level is reached. Then a short settling course of maximum 1 minute is expected.

It is intended that an accuracy of ±0.2°C relative to optimal temperature level is attained. The temperature measuring device is preferably to adjust the heat supply with fixed intervals, e.g. of 30 s, or other intervals down to 1 s.

It is possible to make the arrangement with an automatic control in the shape of a computer with possibility of receiving indication at maximum regulation of heat supply, indication of the time at which the heat supply occurs, registration of temperature course and pattern of movement together with other desirable registrations.

The final product can be made as a PROM solution, a PLC solution or a PC computer based solution.
Description of the Drawing

The invention will now be explained in connection with a special embodiment and with reference to the accompanying drawing, where:

Fig. 1 shows a schematic view of the main elements in the arrangement according to the invention,

Fig. 2 shows a course of a curve for a desired temperature level by a method according to the invention, and

Fig. 3 shows a course of a curve for temperature registration and power supply when the animals leave the area.

In the drawing, only the most essential elements necessary for understanding the idea of the invention are shown. In practice, there will be need for more components for a functioning arrangement. However, a choice of such components will lie within the possibility of the skilled in the art in the light of the above description of the invention.

In Fig. 1 is shown an area 1 in a stable. The area 1 is placed under a heating lamp 2, which is connected to an automatic control 3. The automatic control 3 and the heating lamp are powered via existing 230V installation 4. The automatic control 3 is adapted to regulate the power supply for the heating lamp 2, or to switch it off completely.

An infrared temperature measuring device 5 is provided so that it can register the temperature in the area 1. The temperature measuring device 5 will thus register the body heat for piglets (not shown) located in the area 1. The temperature measuring device 5 may be incorporated in the heating lamp 2 or may be provided as a separately mounted component.

Fig. 2 shows a curve 6 indicating a desired temperature level, which is indicated in °C, in dependence of time which is indicated in weeks. It appears that there is desired a temperature course dropping from 38°C to 29°C from the time the pigs are born (day...
0) until the pigs are four weeks old. This curve is laid in as control parameter in the automatic control 3.

The shown arrangement is applied in that the temperature is registered by the measuring device 5. When piglets are present in the area 1, this registration is used for controlling the power supply to the heating lamp 2 in order thereby to regulate the temperature to the desired predetermined level on the curve 6. Hereby, the temperature is held on the desired level when registration of a temperature within a predetermined range around the curve 6 has been performed.

When the piglets are leaving the area 1, this is registered by the measuring device 5 which registers low temperature. This temperature registration is used for regulating the power supply to the heating lamp.

This is effected by a relation between temperature registration and power supply. By registering falling temperature, which is shown with a curve 7, the automatic control 3 will increase the power supply shown by a curve 8. This occurs until there is registered a temperature at a level 9 located below a range of 5°C under the curve 6 (not shown in Fig. 3). At this time, a momentary reduction/interruption of the power supply to a level 10 occurs. Hereby, the temperature will rapidly fall until the temperature in the area (the micro climate) reaches the temperature level 11 in the stable (the macro climate), after which stabilisation of the temperature at this level occurs. The power/heat supply is then only connected at the registering of a temperature within the said range when the piglets are entering the area again.
CLAIMS

1. Method for controlling the temperature in an area of an animal stable where heat supply is controlled in dependence of a temperature registration in the area, characterised in that the temperature registration is used for regulating the temperature to a desired predetermined level by registering a temperature within a predetermined range around the predetermined level, that the temperature registration is used for reducing/interrupting the heat supply at the registration of a temperature under the predetermined range, and that the heat supply is connected at the registration of a temperature within the range.

2. Method according to claim 1, characterised in that the level and the range are changed with time and are preferably decreasing.

3. Method according to claim 1 or 2, characterised in that the registration of the temperature includes registration of the temperature of the animal bodies, preferably by infrared temperature measurement of surface temperature.

4. Method according to any preceding claim, characterised in that adjusting of the heat supply is effected as a consequence of temperature registration with fixed time intervals.

5. Method according to any preceding claim for regulating the temperature in a piglet nest in a farrowing stable, characterised in that the temperature level falls from about 38°C to about 34°C, or even down to about 29°C, through the first four weeks of life of the piglets, and that the heat supply is reduced/interrupted at the registration of a temperature deviating more than 0.1°C below the said temperature level.

6. Arrangement for controlling the temperature in an area of an animal stable, where heat supply is controlled in dependence of a temperature registration in the area, characterised in that the arrangement includes controllable heaters that are connected with a temperature measuring device arranged for measuring a temperature in areas, pref-
erably the temperature of the animal bodies, and an automatic control arranged for
regulating the heaters in order to keep the temperature at a desired predetermined level
at the registration of a temperature within a predetermined range around the predeter-
mined level, and to interrupt the heaters by registering a temperature below the prede-
termined range.

7. Arrangement according to claim 6, characterised in that the heaters include a heat-
ing lamp, that the temperature measuring device includes an infrared temperature
measuring device.

8. Arrangement according to claim 7, characterised in that temperature measuring
device and automatic control are incorporated in the heating lamp.

9. Arrangement according to claim 6 or 7, characterised in that the automatic control
is connected with a computer for registering temperature progress and pattern of
movement.

10. Arrangement according to any of claims 5 – 9, characterised in that it is adapted
for use in a piglet nest in a farrowing stable.
Fig. 1

Fig. 2

°C

38

29

0 1 2 3 4

T

SUBSTITUTE SHEET (RULE 26)
Fig. 3
INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 03/00015

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A01K 1/02, G05D 23/27 // A01K 31/19
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)

IPC7: A01K, F24D, G05D

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

SE, DK, FI, NO classes as above

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>DE 29512064 U1 (GRAU, JOACHIM), 16 November 1995 (16.11.95), claims 1-11</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

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