Abstract: The present invention relates to a system for keeping a patient warm, particularly a veterinary patient, during care. An apparatus is provided for delivering conditioned air across a barrier, such as a wire cage, to a blanket arrangement for providing conditioned air to the patient. A first duct and a second duct part are provided either side of the barrier mounted together across the barrier, so a duct is provided for ducting conditioned air across the barrier.
IMPROVED PATIENT WARMING SYSTEM

Field of the Invention

The present invention relates generally to a system for keeping a patient warm during care and, more particularly, to an apparatus for delivering conditioned air across a barrier and a blanket arrangement for providing conditioned air to the patient, particularly, but not exclusively, for use in veterinary care.

Background of the Invention

There are many circumstances in human and animal medicine where it is necessary to keep a patient warm to, for example, prevent or treat hypothermia. Forced warm air heating systems have been designed to keep patients warm during surgery and during critical care (e.g. recovery post-surgery).

Forced warm air heating systems were originally designed for use in human medicine only, for the prevention and treatment of hypothermia during anaesthesia and in critical care. Primarily, the blankets were placed over patients recovering from anaesthesia. Recently blankets have been designed to provide warm air heating for animals during surgery and recovery (see the applicant's earlier International Patent Application No. PCT/AU2003/001626, the disclosure of which is incorporated herein by reference).

Forced warm air heating systems usually comprise a blanket-type arrangement which comprises at least two layers forming a hollow space between them when air is delivered to the space. The blanket or a portion of the blanket may include one or more air holes or it may be of a porous/permeable material, to allow warmed air through
the blanket to warm the patient. For small animals, blankets of or having a portion of permeable/porous material are preferred so that the warm air is diffused over the surface of the material (for example, the design disclosed in applicant's earlier PCT application No. PCT/AU2 003/00162). 

Forced warm air heating systems also include a heating unit for providing the warmed air, and a conduit, which may be in the form of a hose and/or pipe for delivering the warmed air from the heating unit to the blanket arrangement.

Animal patients during critical care or recovery (e.g. post anaesthesia) are usually caged for their restraint and safety (semi-conscious animals move about and can become injured through misadventures such as falling off treatment tables). Where an animal needs to be warmed during care, in the cage, this leads to a problem in using warmed air heating systems. The heater (with an electricity supply and heating unit, etc) must be placed outside the cage and any blanket arrangement must obviously be placed in the cage. There is therefore difficulty in providing the warm air conduit from the heater to the patient through the cage. The cage door must be properly shut so that the animal can't fall out. This problem is exacerbated by the fact that there are many different types of cages provided for veterinary patients, which, for example, have different diameters of bars, different grill patterns or grill widths for the cage and cage doors. These problems prevent currently available hoses/piping providing heating conduits from being able to pass through a cage or cage door into a cage.

Presently available warm air blanket arrangements typically have only one port by which warm air can enter
the blanket (via the conduit). Generally, it is not convenient for the blanket to be moved once the patient is in the cage. Having only one port, say at the head of the blanket, may make it difficult for the warm air to be provided to the blanket without moving it. Having the port at the head end of the blanket (which is usually the case) in many cases, does not provide a convenient position for introducing the warmed air conduit to the port when the blanket arrangement is positioned within a cage.

Cages for animals in veterinary establishments are usually of a form having a solid bottom, ceiling and sides (which may be of metal or wood) and then one or two barred doors on the front of the cage, which swing fully open. As discussed above, trying to pass warmed air from a forced warmed air heating system via a conduit into the cage is difficult. The only option may be the cage door, which presents the further difficulty that the cage door must be able to be opened, sometimes quickly for urgent access.

**Summary of the Invention**

In accordance with a first aspect, the present invention provides an apparatus for facilitating delivery of conditioned air across a barrier to a blanket arrangement providing the conditioned air to a patient, the apparatus comprising a first duct part, a second duct part and a mounting mechanism, the mounting mechanism arranged to mount the first duct part on one side of the barrier and the second duct part on the other side of the barrier opposite the first duct part, to provide a duct for ducting conditioned air across the barrier.

In an embodiment, the apparatus is arranged to duct air from a conduit providing the conditioned air to a
further conduit on the other side of the barrier providing the conditioned air to the blanket arrangement. In an embodiment, the first part includes a first connector portion for releasably connecting to the conduit. In an embodiment, the second part comprises a second connector portion for connecting to the further conduit. The first connector portion may comprise a socket connector. The second connector portion may comprise a socket connector.

In an embodiment, the further conduit is integral with the blanket arrangement. In an embodiment, the further conduit is formed by the walls of a port to the interior of the air space of the blanket for receiving conditioned air.

In an embodiment, the apparatus further comprises a seal arrangement for sealing the duct across the barrier. In an embodiment, the sealing arrangement comprises a first seal portion mounted by the first part and a second seal portion mounted by the second part, the first and second seal portions arranged to make a seal across the barrier when the first and second parts are mounted on opposite sides of the barrier.

In another embodiment, the sealing arrangement comprises a seal portion mounted by the first or second part (not by both). The seal portion makes a seal across the barrier between the first and second parts.

In an embodiment, the mounting mechanism comprises a fastening mechanism for fastening the first and second parts to each other across the barrier. In an embodiment, the first part comprises a first flange and the second part comprises a second flange, arranged to be mounted opposite to each other.

In an embodiment, the barrier is part of a cage for
holding the patient. In an embodiment, the part of the cage comprises bars or a mesh. In an embodiment, the part of the cage comprises a door of a cage.

In an embodiment, the patient is an animal patient.

In an embodiment, the invention has the advantage that air can be ducted across a barrier such as a barred or wire cage, for example, without any concern for the distance between the bars or the wire or the mesh. The arrangement ducts the air across the barrier, advantageously without having to change the width of the ducting. In an embodiment, where the apparatus may be mounted on a cage door, it has the further advantage that the cage door can be opened or closed without interfering substantially with the ducting of the air.

In accordance with a second aspect, the present invention provides a system for providing conditioned air to a patient, comprising an apparatus in accordance with the first aspect of the invention, and a blanket arrangement for receiving the conditioned air and providing it to the patient.

In an embodiment, the blanket arrangement includes a pervious surface through which conditioned air may pass to the patient. In an embodiment, the pervious surface is a permeable surface.

In accordance with an embodiment, the system further provides a conduit for providing conditioned air to the apparatus for facilitating and delivering the conditioned air across a barrier, and a further conduit for delivering the conditioned air to the blanket arrangement.

In an embodiment, the further conduit is formed by the walls of a port to the interior air space of the
blanket arrangement.

In an embodiment, the system further comprises a conditioning unit for providing conditioned air to the conduit. In an embodiment, the conditioning unit is a heater for providing warmed air.

In an embodiment, the barrier is a part of a cage, and the system further comprises the cage.

In accordance with a third aspect, the present invention provides a blanket arrangement for delivering conditioned air to a patient, the blanket arrangement comprising at least two layers capable of forming an air space between them for receiving conditioned air, at least one of the two layers having at least a portion of its surface being pervious so that the conditioned air may be delivered to the patient, and a plurality of ports to the interior of the two layers, each of the ports being able to receive a part of a conduit for conducting conditioned air to the air space.

In an embodiment, the blanket arrangement has at least two corners, and a port is provided in each of the corners.

In an embodiment, the portion of the surface being pervious is one side of the blanket arrangement, another side of the blanket arrangement being impervious.

In an embodiment, the blanket is substantially square or rectangular.

In an embodiment, the blanket is sized to fit in a patient receiving space. In an embodiment, the patient receiving space is the floor of a veterinary cage.
In an embodiment, the ports are directed at an angle of between 30 and 50 degrees to the longitudinal axis of the blanket arrangement.

In another embodiment, the ports are directed in the same line as the length of the blanket arrangement, parallel to the longitudinal axis of the blanket arrangement.

In another embodiment, the ports are directed transversely to the length of the blanket arrangement, at approximately 90° to the blanket arrangement.

In an embodiment, the blanket arrangement of the invention may have the advantage that, because it has a plurality of ports, the blanket may be positioned in any configuration within, for example, an animal cage, and it can still be easily connected to a conduit for delivering warmed air, for example. Further, in the embodiment where the ports are angled, motion of a conduit connected to one of the ports, e.g. when a cage door is opened, may not effect a large movement of the blanket, so that the blanket advantageously stays substantially in position within the cage.

In an embodiment, there may be more than two ports.

In accordance with a fourth aspect, the present invention provides a blanket arrangement for delivering conditioned air to a patient, the blanket arrangement comprising at least two layers capable of forming an air space between them for receiving conditioned air, at least one of the two layers having at least a portion of its surface being pervious so that the conditioned air may be delivered to the patient, and at least one port to the interior of the two layers, the port being able to receive a part of a conduit for conducting conditioned air to the
air space, the port being directed at an angle to the longitudinal axis of the blanket arrangement.

In an embodiment, the angle is between 30° and 50° to the longitudinal axis.

In an embodiment, the angle is approximately 90° to the longitudinal axis.

In an embodiment, there are a plurality of ports.

In accordance with a fifth aspect, the present invention provides a system, comprising a blanket arrangement in accordance with the fourth aspect or the third aspect of the invention, and an apparatus in accordance with the first aspect of the invention.

In accordance with a sixth aspect, the present invention provides a method of facilitating delivery of conditioned air across a barrier to a blanket arrangement providing the conditioned air to a patient, comprising the steps of ducting the air via the barrier.

Brief Description of the Drawings

Features and advantages of the present invention will become apparent from the following description of embodiments thereof, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a picture of warmed air heating system for a patient, in accordance with an embodiment of the present invention;

Figure 2 is a diagram of a blanket arrangement in accordance with an embodiment of the present invention;
Figure 3 is a diagram of a blanket arrangement in accordance with a further embodiment of the present invention;

Figure 4 is a diagram of a blanket arrangement in accordance with yet a further embodiment of the present invention;

Figure 5 is a picture of the blanket arrangement of the embodiment of Figure 3;

Figure 6 is a view of an apparatus for facilitating delivery of conditioned air across a barrier, in accordance with an embodiment of the present invention, showing a first and second part of the embodiment being separated;

Figure 7 is a further view of the apparatus of Figure 6, where a first and second part of the apparatus are mounted either side of the barrier;

Figure 8 shows a further view of the apparatus of Figure 7;

Figure 9 shows the apparatus of Figures 6 to 8 connected to a blanket arrangement in accordance with an embodiment of the present invention;

Figure 10 shows a picture of an apparatus in accordance with the embodiment of Figures 6 to 8, shown connected to a blanket arrangement in accordance with an embodiment of the present invention;

Figure 11 shows a blanket arrangement and apparatus in accordance with an embodiment of the present invention being used for treatment of a patient;
Figure 12 shows a blanket arrangement of another embodiment of the present invention and apparatus in accordance with an embodiment of the present invention being used for treatment of a patient;

Figure 13 is a diagram of a blanket arrangement in accordance with a further embodiment of the present invention; and

Figure 14 is a diagram of a blanket arrangement in accordance with an embodiment of the invention.

Detailed Description of Embodiments

A system for providing conditioned air to a patient, in accordance with an embodiment of the present invention, is shown in Figure 1.

This embodiment comprises an apparatus, generally designated by reference numeral 1 for facilitating delivery of conditioned air (in this example warmed air) across a barrier to a blanket arrangement, generally designated by reference numeral 2. In this example embodiment, the barrier is the door 3 of a cage 4 arranged for containing an animal patient being treated. For example, the patient may be recovering from anaesthesia or surgery, or may be otherwise undergoing critical care.

In this embodiment, the system comprises a conduit 5 for delivering warmed air to the blanket 2. The conduit 5 comprises a conduit part 6, outside the cage 4 and further conduit part 7 mounted inside the cage 4 and connecting to the blanket 2 via port 8. In this example, the apparatus 1 effectively connects the conduit part 6 and further conduit part 7 to facilitate delivering of air to the blanket 2.
The system further comprises, in this embodiment, a heater unit 9 for providing warmed air.

The heating unit 9 includes controls 10 that enable a selection of a number of temperatures for the warmed air. For example warmed air may be delivered at temperatures of 34, 37, 40, 43 or 46 degrees centigrade.

The blanket arrangement 2, comprises two layers 12 and 13 bonded together at a seam 14. In this embodiment, the upper layer 12 is of non-pervious material, and the lower layer 13 is of a permeable material, allowing air to diffuse through it to warm the patient. In an embodiment the blanket may be made from polyester, the second layer 13 being of a porous polyester material. This is similar to the blanket disclosed in the applicant's earlier PCT application, number PCT/AU2003/001626.

In operation, the blanket 2 may be put over the patient or under the patient, so that warmed air is delivered via the porous material layer 13.

Animals undergoing post anaesthesia recovery or critical care are caged for their restraint and to permit observation and treatment, and for safety (semi-conscious animals move about and can become injured through misadventures). As can be seen from Figure 1, the cage 4 shown is of a common type, with solid floor, ceiling and walls, and barred doors 3 that open outwards to enable access to the entire interior of the cage 4. The doors 3 of such cages must be properly shut so that the animal can't fall out.

Where warm air is being introduced to keep an animal in the cage warm, this obviously leads to an issue of how the warmed air is conveyed from the heater unit 9 through the barrier of the door bars to the interior of the cage.
and the blanket arrangement.

There are many animal cage manufacturers worldwide all using different designs and, for example, different diameters of steel rod, different grill patterns or grill widths for their cage doors. This further exacerbates the problem. The typical spacing between a vertical grill is 25 to 35 millimeters. This typical width is not sufficient to enable the conduit of typical warming systems to get through (the conduit is typically 60 millimeters or so in diameter).

Another issue is that it is obviously important to be able to open the doors easily and quickly to obtain access to the patient, which sometimes must be done urgently. The cage door must be able to swing open and access to the patient be unobstructed. At this time a hand may be needed to restrain the patient so it doesn't climb or fall out.

Another issue is that the warming conduit might be required to be moved quickly between cages to suit patient needs or from the right or left side of the cage depending on patient position and application.

All this is difficult with current air warming systems and conduits.

Another issue is that the warm air blanket 2 inside the cage should not be disturbed when the door shuts, so that it remains appropriately positioned over (or under) the patient. With current blankets, a port is provided in one position only (usually in the centre of the shorter side of the blanket). This position may not be ideal to the blanket remaining undisturbed when the cage door is closed and the conduit is moved. Further, the blanket may need to be set up on top of the patient, underneath the
patient, or to the left or right of the cage, and with only one conduit (current blankets) access via only one port is difficult.

Figure 2 shows an embodiment of a blanket in accordance with the present invention, which is pictured in Figure 1. The blanket 2 comprises a plurality of ports 8, in this embodiment one port 8 at each bottom corner of the blanket 2. This allows ease of access by the conduit part 7 of the heating conduit 5, whether the blanket is used with the porous surface 13 downwards or the porous surface 13 upwards. The two ports 8 allow the conduit part 7 to be connected to the blanket 2 close to the cage door 3 in either configuration.

The ports 8 are also angled at about 30 to 50 degrees (preferably around about 45 degrees) to facilitate ease of access by the conduits 7. That is, the ports 8 are angled to the longitudinal direction of the blanket 2. This facilitates the blanket 2 remaining stationary when the cage door 3 is opened and shut, so the blanket is not disturbed from its position with respect to the patient. This also enables the blanket to be positioned over or under the patient with the cage door opened and the conduit 7 attached to the port.

Note that the ports 8 have a tie 15 which is used to secure the port 8 to the conduit 7.

The angled entry port 8 "softens" the effect of moving the inlet tube 7 through 90 degrees (cage door going from closed to open or vice versa), and the blanket 2 has minimal movement.

Advantageously, the features of the plurality of ports allows the blanket 2 to be used over the patient or under the patient and also the ports can be directed to
either end of the cage so that the blanket can be used substantially in any configuration with respect to the cage 4.

The blanket 2 has a plurality of longitudinally extending air tubes 16. In this embodiment there are five longitudinally extending air tubes 16. If the blanket is positioned below the animal, for example, the animal may occlude some air tubes but not completely obstruct air flow.

Dimensions are given in millimetres of the blanket of the embodiment of Figure 2. The blanket of Figure 2 is arranged particularly to suit dog cages.

The blanket of Figure 3 has similar features to the embodiment of Figure 2, and similar reference numerals have been used. The only thing that is different is the size. This blanket has been developed to suit cat cages.

It will be appreciated that the blanket arrangement can be made any size and it is not limited to those sizes illustrated in the drawings. It can be made any size suitable for any such patient or cage.

Figure 5 illustrates a blanket 2 which is equivalent to the embodiment of Figure 3, shown not inflated.

Figure 4 illustrates an embodiment of a blanket arrangement which is particularly designed to be used underneath the patient. In this embodiment, a pair of inflatable arms 20, 21 surround a patient receiving space 22 of the blanket 23. The arms 20, 21 are joined by an inflatable top section 24. The patient receiving space includes a base of polyester material which is a single sheet or a double sheet which is not inflatable. Air entry ports 25 are provided at each end of each arm 20, 21.
of the "U" shaped arrangement.

In operation, air is introduced into one of the ports 25 and inflates the "U" shaped arrangement comprising arms 20, 21 and connecting top section 24. In this embodiment, the upper surface of the arms, 20, 21 and head section 24 are porous, to allow warm air to be introduced to the patient receiving space 22.

An embodiment of this blanket is pictured in operation in Figures 12 and 10.

Referring to Figures 6 through 10, a description will now be given of an apparatus for facilitating delivery of warmed air across a barrier (in this embodiment being a cage door) in accordance with an embodiment of the invention.

The apparatus comprises a first duct part 41 and a second duct part 42 (in this example the first part is outside of the cage door and the second part is intended inside the cage door). In this embodiment the first duct part 41 and second duct part 42 are provided by plastic sleeve portions 41, 42 which define ports 43, 44 of a duct.

A mounting mechanism, in this embodiment comprising bolts 46 and nuts 47 (a plurality of them) are arranged to mount the first part 41 on one side of the cage door 3 and the second part 42 on the other side of a cage door 3, opposite to each other, to provide a duct, 43, 44 for delivering air into the cage through the cage door 3.

The mounting mechanism 46, 47 is a fastening means which fastens the first part 41 and the second part 42 to each other, against the bars of the cage. It will be appreciated that the gauge of the bar spacing is
irrelevant. The bars could even comprise a mesh, as long as the bolts 46 could project through the mesh.

The fasting mechanism is not limited to a nuts and bolts arrangement, but could be any arrangement for fastening the first part 41 and second part 42 together with the bars of the cage door 3. For example, it could comprise an adhesive to adhere the parts 41 and 42 to the cage bars. It could comprise clips clipping the part 41 and part 42 together through the cage bars. It could comprise other mechanisms.

The apparatus 1 in this embodiment also comprises a sealing arrangement 50, which comprises a first sealing member 51 and a second sealing member 52 mounted on the first duct part 41 and second duct part 42, respectively. In this example, the sealing members 51 and 52 comprise open cell foam rings fixed around the ports 43, 44 forming the duct. When the parts 41 and 42 are mounted, the foam 51 and 52 compresses around the cage door 3 bars and provides a reasonable seal maintaining the ducting of air flow through the cage door 3 within the conduit.

In an alternative embodiment, only a single sealing member 51 or 52 may be required mounted on one only of the first or second duct parts 41, 42. For example, a single open cell ring mounted on one of the duct parts may be sufficient to provide a seal across the barrier to the other duct part. Two sealing members 51 and 52 may, therefore, not be essential.

The ports 43 and 44 also provide connectors for connecting the conduit part 6 (outside the cage) and the further conduit 7 (inside the cage). In this embodiment, the ports form sleeve portions 43 and 44 which form socket connectors.
The conduit 6 includes a socket connector 60 arranged to mate with the socket connector formed by the sleeve portion 43 of the first part 41. The rest of the conduit 6 is formed by a flexible hose 61.

Inside the cage, the conduit 7 is formed from a further socket connector 62, arranged to mate with the socket connector formed by the sleeve portion 44 of part 42. The rest of the conduit 7 is formed by a flexible hose 63.

In this embodiment the arrangement is such that the diameter of the conduit 6, 7 varies only a little via the ducting apparatus 1, so as to minimize resistance to air flow.

The first duct part 41 and second duct part 42 also comprise flange portions 70 and 71 which face each other and mount the sealing arrangement 50 when mounted to the cage door 3. Flange portions 70, 71 allow plenty of room for the fastening mechanism, such as nuts 46 and bolts 47. The flanges 70 and 71 also allow plenty of room to mount the foam portions 51, 52.

Note that the sealing arrangement is not limited to an open cell foam, but could be any flexible membrane which can form around the bars of a cage. In some circumstances, there need not even be a complete seal, but a partial seal will suffice.

Note that in this embodiment, there are no fastening devices on the animal side of the cage that protrude substantially (just bolt heads of the bolts 46). This means there are limited sharp projections for the animal to injure themselves.

The apparatus 1 can be dismantled quite quickly,
can be seen, so the first part 41, for example, could be moved, together with conduit 6 quickly to another cage to mate with another second part 42 so that warmed air can be delivered to the other cage.

As also can be seen, the doors of the cage 4 can be open and shut relatively easily with little movement of the blanket 2.

Figure 11 shows a picture of a patient with a blanket 2 laying over the patient and an apparatus 1 delivering air to the blanket via the cage door 3.

In another embodiment, further conduits 7 on the inside of the cage may not be formed by a separate socket connector 62 of flexible hose 63, but may instead be formed by extended walls of the port 8, the extended walls forming a conduit which may be directly tied around the second duct part 42. All this requires is the walls which form the ports be extended so that they can form a conduit. The walls of the port may be provided with reinforcing or elastic or a tie to tie around the second duct part 42. In an embodiment, the second duct part 42 may include a circumferential groove within which the tie can be seated when the conduit (extension of the port from the blanket) is tied off. The second duct part 42 may have a rounded edge to prevent animals injuring themselves.

Figure 13 shows a further embodiment of a blanket in accordance with the present invention, designated reference numeral 100. The blanket includes a pair of limbs 101, 102 which extends substantially transversely to the longitudinal direction of the blanket 100, and within the ends of which ports 103, 104 are formed. The length of the limbs 101, 102 is such that they can operate as the further conduit, and the ports 103, 104 can be directly
A blanket for a smaller animal cage is shown in Figure 14, generally designated by reference numeral 110. The limbs defining the ports extend in a direction parallel to the longitudinal direction of the blanket. The limbs 111, 112 are of sufficient length that they can operate as further conduits and the ports 113, 114 can be tied directly around the second duct part.

Having blankets with the port "limbs" designed long enough to connect to the second duct part obviates the needs for a second, separate extension conduit on the animal side of the cage door. Further, the extension may be long enough so that the cage door can be opened or closed without "dragging" the blanket off the animal. This means that the animal can be set up with the door open, then the door can be closed, then opened again if it is required to check the animal, without disturbing the blanket orientation.

In the above embodiments, the system is shown being used with a cage for holding animals. The cage need not necessarily be of the form shown (barred doors at the front and solid sides, ceiling and base). The entire cage could be bars, for example. The walls could be glass, apart from the barred doors. Any other arrangement is possible. As discussed above, the bars may be replaced by mesh. In another embodiment, the door may be glass or plastics with a hole for the ducted air, the second part of the apparatus being mounted on the plastic around the hole and the first part being mounted on the other side of the plastics or glass.

In the above embodiments, the system is used to warm animals. In other embodiments it may be used to warm humans, e.g. infants, and the ducting apparatus may be
used to duct air via the bars of a cot or the like, for example.

In the above embodiments, the system is used to provide warm air to the patient. In alternative embodiments it may be used to provide cool air, or any type of conditioned air.

In the above embodiments, the ducting apparatus is in the form of an adapter and connectors are also provided to connect to the warm air conduit. In an alternative embodiment, the warm air conduit may be integral with the first part and the further warm air conduit integral with the second part.

In the above embodiments, the conduit is cylindrical. It is not limited to a circular or oval shape, however, but could be any profile, e.g. rectilinear.

In the above embodiments, the first duct part 41 and the second duct part 42 are of the same configuration. They are therefore interchangeable. The apparatus is therefore easy to manufacture as it only requires one form of duct part. The invention is not limited to this, however, and each of the first and second duct parts could be of different configuration.

In the claims which follow and in the preceding description of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the invention.

It will be understood to persons skilled in the art
of the invention that many modifications may be made without departing from the spirit and scope of the invention.
Claims

1. An apparatus for facilitating delivery of conditioned air across a barrier to a blanket arrangement providing the conditioned air to a patient, the apparatus comprising a first duct part, a second duct part and a mounting mechanism, the mounting mechanism arranged to mount the first duct part on one side of the barrier and the second duct part on the other side of the barrier opposite the first duct part, to provide a duct for ducting conditioned air across the barrier.

2. An apparatus in accordance with claim 1, being arranged to duct air from a conduit providing the conditioned air to a further conduit across the barrier and arranged for providing the conditioned air to the blanket.

3. An apparatus in accordance with claim 2, the first duct part comprising a connecting portion for releasably connecting to the conduit.

4. An apparatus in accordance with claim 2 or claim 3, comprising a second duct part comprising a second connector portion for connecting to the further conduit.

5. An apparatus in accordance with any one of the preceding claims, further comprising a seal arrangement for sealing the duct across the barrier.

6. An apparatus in accordance with claim 5, wherein the seal arrangement comprises a first seal portion mounted by the first duct part and a second seal portion mounted by the second duct part, the first and second seal portions arranged to make a seal across the barrier when the first and second duct parts are mounted on opposite sides of the barrier.
7. An apparatus in accordance with any one of the preceding claims, wherein the mounting mechanism comprises a fastening mechanism for fastening the first and second duct parts to each other across the barrier.

8. An apparatus in accordance with any one of the preceding claims, wherein the barrier is part of a cage for holding the patient.

9. An apparatus in accordance with claim 8, wherein the part of the cage comprises bars or mesh.

10. An apparatus in accordance with any one of the preceding claims, wherein the patient is an animal patient.

11. A system for providing conditioned air to a patient, comprising an apparatus in accordance with any one of the preceding claims, and a blanket arrangement for receiving the conditioned air and providing it to the patient.

12. A system in accordance with claim 11, further comprising a conduit for providing conditioned air to the apparatus for facilitating and delivering the conditioned air across a barrier, and a further conduit delivering the conditioned air to the blanket arrangement.

13. A system in accordance with claim 12, wherein the further conduit is integral with the blanket arrangement.

14. An apparatus in accordance with claim 11, 12 or 13, further comprising a conditioning unit for providing conditioned air to the conduit.

15. A blanket arrangement for delivering conditioned air
to a patient, the blanket arrangement comprising at least two layers capable of forming an air space between them for receiving conditioned air, at least one of the two layers having at least a portion of its surface being pervious so that the conditioned air may be delivered to the patient, and a plurality of ports to the interior of the two layers, each of the ports being able to receive a part of a conduit for conducting conditioned air to the air space.

16. A blanket arrangement in accordance with claim 15, the blanket arrangement comprising at least two corners, wherein a port is provided in each of the corners.

17. A blanket arrangement in accordance with claim 15 or claim 16, the ports being directed at an angle of between 30 and 50° to the longitudinal axis of the blanket arrangement.

18. A blanket arrangement in accordance with claim 15 or claim 16, wherein the port is directed at an angle transverse to the longitudinal axis of the blanket arrangement.

19. A blanket arrangement in accordance with claim 15 or claim 16, wherein the ports are directed at an angle in line or parallel to the longitudinal axis of the blanket arrangement.

20. A blanket arrangement in accordance with any one of claims 15 to 16, wherein the ports are defined by tubes integral with the blanket and forming conduits which are arranged to mate with the conduit conducting conditioned air to the air space.

21. A system for providing conditioned air to a patient, comprising the apparatus in accordance with any one of
claims 1 to 10 and the blanket in accordance with any one of claims 15 to 20.

22. A system in accordance with claim 21, further comprising a conduit for delivering conditioned air to the first duct part and a further conduit for delivering conditioned air from the second duct part to the blanket arrangement.

23. A system in accordance with claim 22, wherein the further conduit is integral with the blanket arrangement.

24. A system in accordance with claims 21, 22 or 23, further comprising an air conditioning unit for providing the conditioned air.

25. A method of facilitating delivery of conditioned air across a barrier to a blanket arrangement providing the conditioned air to a patient, comprising the steps of ducting the air via the barrier.
FIG. 2

TUBES = 5

100mm "APPROX"

AIR ENTRY
IDEALLY ABOUT
30 - 45°

FIG. 3

TUBES = 5

AIR ENTRY
30 - 45° ENTRY

FIG. 4

SUBSTITUTE SHEET (RULE 26)
## INTERNATIONAL SEARCH REPORT

**International application No.**
PCT/AU20 10/000383

### A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

- A61F 7/00 (2006.01)
- A47C 21/04 (2006.01)
- A47G 9/00 (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)

- Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
  - WPI, EPDOC: IPC/EPC A61F H-, A47G 9/-, A47C 21/-, AOIK 1/-, A61D & Keywords (air, duct, conduit, connection, cage, blanket, heat, animal) and like terms

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
</table>

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

- **"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)
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- **"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**
08 June 2010

**Date of mailing of the international search report**
11 JUN 2010

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Form PCT/ISA/210 (second sheet) (July 2009)
INTERNATIONAL SEARCH REPORT

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:

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:

Supplemental Box 1.

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. [X] 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.:
   1-14 and 25

Remark on Protest

[ ] 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.

Form PCTnSAJHO (continuation of first sheet (2)) (July 2008)
INTERNATIONAL SEARCH REPORT

Supplemental Box 1
(To be used when the space in any of Boxes I to IV is not sufficient)

Continuation of Box No. 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.

In assessing whether there is more than one invention claimed, I have given consideration to those features which can be considered to potentially distinguish the claimed combination of features from the prior art. Where different claims have different distinguishing features they define different inventions.

This International Searching Authority has found that there are different inventions as follows:

- Claims 1 to 14 are directing to an apparatus for facilitating delivery of conditioned air to a patient comprising a first duct part, a second duct part and a mounting mechanism. It is considered that the mounting mechanism arranged to mount the first duct part on one side of the barrier and the second duct part on the other side of the barrier opposite the first duct part comprises a first distinguishing feature.

- Claims 15 to 20 are directing to a blanket arrangement comprising at least two layers capable of forming an air space between them for receiving conditioned air, and a plurality of ports to the interior of the two layers. It is considered that each of the ports being able to receive air of a conduit for conducting conditioned air to the air space comprises a second distinguishing feature.

- Claims 21 to 24 are directing to a system for providing conditioned air to a patient comprising the apparatus in accordance with any one of claims 1 to 10 and the blanket in accordance with any one of claims 15 to 20. It is considered that the combination of the apparatus in accordance with any one of claims 1 to 10 and the blanket in accordance with any one of claims 15 to 20 comprises a third distinguishing feature.

- Claim 25 is directing to a method of facilitating delivery of conditioned air to a barrier to a blanket arrangement providing the conditioned air to a patient comprising the steps of ducting the air via the barrier. It is considered that the steps of ducting the air via the barrier comprises a fourth distinguishing feature.

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.

Each of the abovementioned groups of claims has a different distinguishing feature and they do not share any feature which could satisfy the requirement for being a special technical feature. Because there is no common special technical feature it follows that there is no technical relationship between the identified inventions. Therefore the claims do not satisfy the requirement of unity of invention apriori.

The International Searching Authority believes that a search and examination for the fourth invention will not involve more than negligible additional search and examination effort over that for the first invention and so no additional search fee is required in order to search and examine that invention.
This Annex lists the known "A" publication level 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.

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<td>NONE</td>
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Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX