

Intelligent exhaust and air conditioning system for data centres or similar facilities

This application relates to a cooling system for data centres
5 and for facilities that generate waste heat. The application
also relates to housings or cabinets for electronic equipments
that require air-cooling. The electronic equipments can
be used in both controlled environments, such as computer
data rooms and non-controlled environments, such as offices,
10 factories, and external sites.

Data centres are important business facilities, which aim to
provide protected environments for housing electronic equipments,
such as computers and telecommunications systems, to
15 provide a wide range of applications.

An ever-increasing numbers of individuals and businesses rely
on the Internet. This gives rise to facilities for application
service providers, internet service providers, network
20 operation centres, as well as co-location and web-hosting
sites, which are becoming busier and common nowadays. In particular,
the growth of the Internet has resulted in unprecedented levels
of server-based computing. The providers have found that many
of their network infrastructure and web based
25 applications work best on dedicated computer servers.

WO2008/152416 of JCA TECHNOLOGY discloses a cooling cabinet
having an active cabinet exhaust for drawing hot air away
from the cooling cabinet. Cold air permeates the cabinet via
30 its lateral sides from a surrounding of the cooling cabinet.

WO03/083631 of TECHNIKON discloses a rack cabinet that has a
ventilation inlet for receiving cold air. The rack cabinet

has slots on its sidewalls, which allows the discharge of hot air and the intake of cold air.

The object of this application is to provide an improved
5 cooling system or cooling system for data centre or similar facilities.

This application provides a room. The room can be used as a data centre that houses computer servers. The room comprises
10 a room wall, a room air outlet, a cabinet or housing with an enclosure, and one or more cabinet fans. The cabinet is also called a casing. The cabinet or housing can include an inner room.

15 Structurally, the room wall separates air inside the room from air outside the room whilst the room air outlet connects an inside of the room with an outside of the room. The enclosure receives one or more electrical equipments. The enclosure comprises a first zone and a second zone.

20 The enclosure can have different sizes. In one implementation, the enclosure has the size of a room. In another implementation, the enclosure is just large enough for the equipment to be moved in and be installed.

25 The first zone provides an equipment space for taking up the electrical equipments and it is intended for receiving room air or cooling air from other source. The second zone is provided with a cabinet air outlet that is connected with the
30 room air outlet. The second zone normally has elevated temperature due to heat from the operating electrical equipments.

The cabinet fans are used for generating an air stream from the equipment space to the second zone, from the second zone to the cabinet air outlet, and from the cabinet air outlet to the room air outlet. The cabinet air outlet can be provided
5 next to the room air outlet or it can be joined to the room air outlet via a length of tube or pipe.

In effect, operational equipments placed in the equipment space receive air from the first zone and it exhausted hot
10 air into the second zone. This hot air is removed from the cabinet, via the cabinet air outlet, via the room air outlet and to outside of the room.

This has the advantage of saving energy. Heat energy from the equipments is transferred via air movement or extraction to
15 outside area of the area. Cooling air is not used to cool the operating equipments. Energy used for this heat transfer would be much less than energy used for equipment cooling. Thus, the energy saved by this application is significant.

In practise, there can be a small air stream from the cabinet back to the room, but this is not intended in the first
20 place. Normally, a bigger air stream is provided from the first zone to the second zone.

The fans can be located at different positions. It can be positioned inside the room, inside the enclosure, or outside
25 the room. The different fan positions allow a user flexibility to overcome any practical constraint in installing the
30 fans.

The fans can also comprise one or more temperature monitors or sensors for controlling rotating speeds of the fans. The

rotating speeds of the fans can then be optimised or be improved to remove heat from the electrical equipments.

The electrical equipments can be mounted on one or more
5 equipment racks for ease of installation and maintenance.

The electrical equipments can comprise one or more equipment fans for receiving or drawing air from the first zone and for exhausting air to the second zone. The exhausted equipment
10 air is normally at an elevated temperature. These fans facilitate the flow of air through the equipment and its fan speeds can be adapted or be varied for different requirements of the respective equipment.

15 The electrical equipments can include one or more computer servers as well as its supporting equipments. In other words, the application can be applied for cooling computer servers.

The cabinet can receive air in different ways for the flexibility of implementation. It can comprise one ventilation
20 openings for allowing room air to be drawn inside of the cabinet. Alternatively, it can include one or more cabinet air inlets for receiving external cooling air. The cabinet air inlets can receive cooling air from a cabinet air conditioning unit.
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In the above cases, temperature sensors can be placed inside the hot zone or inside the cool zone to control the cabinet or room air conditioning because otherwise there may be too
30 much cooling that result in waste of energy.

For additional protection, the cabinet can comprise a door that opens automatically when inside cabinet temperature exceeds a pre-determined value.

- 5 The room can also include a messaging device for sending one or more SMS status messages to maintenance personnel. The SMS messages can be sent when the cabinet temperature exceeds a certain preset value, or it can be sent at regular intervals.
- 10 The application provides an equipment cabinet. The equipment cabinet comprises an enclosure for receiving one or more electrical equipments.

The enclosure comprises a first zone or cool zone and a second zone or hot zone. The first zone provides an equipment space for taking up the electrical equipment and the second zone is provided with a cabinet air outlet for connection with a room air outlet.

- 20 The enclosure also comprises means for making sure that an air-flow or an air stream is provided from the first zone to the second zone, which is bigger than airflow from the second zone to the first zone. In other words, the amount of air that flows from the second zone to the first zone is not significant.
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This cabinet thus has the advantage of channelling hot equipment air out of the cabinet rather than using cooling air to cool the operating equipment. This technique of managing equipment heat requires less energy.

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The application provides a method for cooling an electrical-equipment, which is provided in a room. The method comprises

steps of providing ambient air inside the room that is separated from environmental air outside the room. An enclosure is then provided inside the room. The enclosure separates enclosure air that is inside the enclosure from ambient air that is in the room. It is clear that the enclosure air inside the enclosure is not to be seen as ambient air in the room. The electrical equipment is later provided in a first zone or cool zone in the enclosure. An enclosure air stream is afterward generated from the equipment to a second zone or hot zone of the enclosure and from the second zone to the outside of the room. This method provides an efficient way of managing heat that is generated by the equipment.

The method can comprise a step of cooling of the air stream before the air stream contacts the equipment. The cooled air stream can then provide effective cooling for the equipment.

Readings of one or more temperature sensors can be used to control or adjust the cooling of the air stream. The sensor can be placed directly on the equipment. It can be placed to read temperature of air stream before or even after it contacts the equipment. With this method, the air stream of the appropriate temperature can be provided to the electrical equipment.

The method can include a step of generating the air stream by suction or by compression. In other words, the air stream can be provided by applying a positive pressure or a negative pressure to the room. The suction or compression can be provided inside the room, inside the enclosure, outside the room, or a combination of any of these.

Put differently, the application provides an improved cooling system for computer servers. The servers act as central computers from which other computers obtain information.

5 The cooling system includes one or more cooling cabinets for server racks in a data centre room. The racks hold multiple servers. The cooling cabinets can shield the servers from air that is inside the data centre room and that is outside of the cooling cabinet. The cooling cabinet can have an inlet
10 for receiving external cooling air and have an exhaust outlet for discharging hot air. The hot air contains heat energy that is generated by the operating servers. The external cooling air does not essentially mix or contact with the room air.

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The server generated heat energy is discharged or is transferred away from the cooling cabinet via the cabinet exhaust outlet. To reduce waste, the discharged heat energy can be used for other purposes, such as heating of a room or hot water for bathing. The recycling of the waste or unwanted heat
20 can be implemented in many countries, regardless of their geographical locations or climate conditions.

This is unlike other cooling systems that allow heat energy,
25 which is generated by servers, to be discharged into a room that houses the servers. The generated heat energy elevates the room temperature. Air conditioning of the room provides cooling air to reduce the elevated temperature. Put differently, the room air conditioning is burdened with the server
30 generated heat energy.

This application has the benefit in terms of substantial savings of air conditioning energy. The saving essentially corresponds to the amount of server-generated energy.

5 To provide efficient and effective discharge or dissipation of waste heat from the server, the cooling system can have an intelligent control system. The intelligent control system has one or more cabinet exhaust fans that are installed with temperature monitors. The exhaust fans use output values of
10 the temperature monitors to adjust speeds of the exhaust fans to optimize or to improve the discharge of the server unwanted heat energy.

Further, the control system can open a door of the server
15 cooling cabinet for discharging the server hot air away from the servers in the event of emergency for safety purpose. The cooling cabinet door is opened when the monitored temperature exceeds a predetermined value.

20 The intelligent control system can use a Controller Area Network (CAN) to link parts of the control system. This type of network is readily available for easier implementation.

Air conditioning for the data centre room can be turned on
25 only when the room temperature exceeds a predetermined set point value to conserve energy.

Alert messages can be triggered and be sent automatically using Short Message Service (SMS) in the event of cooling system failure. Maintenance crew then activate resources to address the system failure using the messages.
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The cooling cabinet can also be customised and be constructed for easier augmentation or support of the cooling system.

In the following description, details are provided to describe an embodiment of the application. It shall be apparent to one skilled in the art, however, that the embodiment may be practised without such details.

Figures below have similar parts. The similar parts have the same part numbers or the same names. The complete description of the similar parts is hereby incorporated by reference to the respective part of another figure, where appropriate, thereby reducing repetition of text without limiting the disclosure.

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Fig. 1 illustrates a first embodiment of an improved cooling system,

Fig. 2 illustrates a second embodiment of the improved cooling system, and

20 Fig. 3 illustrates a third embodiment of the improved cooling system.

Fig. 1 shows an embodiment of an improved cooling system 10. The cooling system 10 includes a data centre room 11 and a plurality of cooling cabinets 12 that are positioned in the data centre room 11.

Referring to the data centre room 11, it has a double ceiling structure 15, a double flooring structure 16, and walls 17.

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The double ceiling structure 15 includes a base ceiling 26 and a suspended ceiling 27 that is installed below the base ceiling 26. The suspended ceiling 27 has a plurality of ceil-

ing panels that are not illustrated in Fig. 1. The suspended ceiling 27 and the base ceiling 26 combine to define a free space or a ceiling void 30.

5 Similarly, the double flooring structure 16 comprises a base floor 33 and a raised floor 34 that is installed at a pre-determined height above the base floor 33. The base floor 33 and the raised floor 34 define a free space or a floor void 37. The raised floor 34 comprises a plurality of floor panels
10 that are not shown in Fig. 1.

In addition, the data centre room 11 also has a room air conditioning unit 23 that includes a fan coil unit 40, a compressor unit 41 and a temperature sensor or monitor 43. The
15 compressor unit 41 is connected to the fan coil unit 40 via copper pipes 42 that covered with a thermal insulating material. The temperature sensor or monitor 43 is connected to the fan coil unit 40.

20 The fan coil unit 40 is mounted in the ceiling void 30 whilst the compressor unit 41 is mounted above and on the base ceiling 15. The temperature sensor 43 is mounted in the ceiling void 30 but can also be mounted inside the data centre room 11.

25 Further, an external air inlet 31 is mounted in the ceiling void 30 and is connected to a hollow pipe 45 that extends through one wall 17 and extends outside of the data centre room 11. A room air inlet 21 and a room air outlet 22 are
30 mounted on the suspended ceiling 27. A cooling air outlet of the room air conditioning unit 23 is connected to the room air inlet 21.

Referring to the cooling cabinets 12, they house server racks that hold computer servers 55. The server racks are not shown in Fig. 1 for simplicity. The raised flooring 34 supports the cooling cabinets 12 and server racks.

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The cooling cabinets 12 have cabinet panels 54 and an air outlet 50. The cabinet panels 54 that surround the server racks whilst the air outlet 50 is connected to a cabinet exhaust fan 51 via a cabinet air tube or pipe 52. The cabinet
10 exhaust fan 51 is connected to several temperature monitors 53 that are mounted inside the cabinet air pipe 52.

The servers 55 have internal exhaust fans. Utility for the servers 55, such as power supply and system communication,
15 are routed via the floor void 37 and via holes in the raised floor 34 to the servers 55. In a generic sense, other equipments that require air-cooling can replace the servers 55.

Functionally, referring to the data centre room 11, the ceiling void 30 is often used as a technical zone for placing cables, light fittings, and pipes. The ceiling panels permit
20 easier access the technical zone.

Likewise, the floor void 37 is often used as an air passageway and often as a technical service zone for power and data
25 cables. The floor panels permit easier access to the technical service zone.

The room air conditioning unit 23 provides cooling to the data centre room 11. To save energy, the room air conditioning unit 23 is turned on only when needed or when the room
30 temperature is above a preset value.

In essential, the room air conditioning unit 23 acts a cooling circuit to transfer heat energy from one location to another. In particular, the compressor unit 41 acts as a heat exchanger to draw heat energy from the fan coil unit 40 and to release the drawn heat energy into air that is outside of the data centre room 11. A fan of the compressor unit 41 blows away the heated air.

The fan coil unit 40 is used to release cooling air to the ceiling void 30. The cooling air lowers air temperature of the ceiling void 30. The fan coil unit 40 can use readings from its temperature monitors 43 to control release of the cooling air as well as to control temperature of the released cooling air.

The external air inlet 31 is used for drawing fresh air that is outside of the data centre room 11 to the ceiling void 30. The drawn external fresh air then mixes with the air that is released by the fan coil unit 40.

The room air inlet 21 and the room air outlet 22 both act to circulate air between the ceiling void 30 and inside the room 11. The room air inlet 21 is used for drawing air that is inside of the ceiling void 30 to inside of the data centre room 11. Similarly, the room air outlet 22 is used for drawing air that is inside of the data centre room 11 to inside of the ceiling void 30.

Referring to the cooling cabinets 12, the server racks are adapted to hold the respective different servers 55. The servers 55 provide application or information for other computers or users.

One side of the cabinet panels 54 has ventilation holes that allow room air to be drawn to the inside of the cooling cabinet 12. The ventilation holes are located near air inlet air of the servers 55 for easy drawing of the room air into the servers 55.

The server exhaust fans act to extract heat energy that is generated by the servers 55 away from the servers 55. The server exhaust fans draw cabinet air that is in one part 56 of the cabinet 12 to inside of the servers 55 and exhaust server generated hot air to another part 57 of the cabinet 12, which is also called a hot zone. The cabinet exhaust fans 51 act to draw the exhausted server generated hot air away from the cooling cabinet 12. The server exhaust fans can have temperature control for regulating rotating speed of the exhaust fans.

To minimise or avoid air from the part 57 flowing to the part 56 of the cabinet 12, space or gap between the servers 55 and the cabinet 12 can be sealed with material, such as rubber. The cabinet 12 can also be adapted to reduce any gap between the servers 55 and the cabinet 12. These features channel the air in part 56 to flow through the servers 55 to the part 57 of the cabinet 12.

Further, cabinet fans that may draw air from the part 57 to the part 56 of the cabinet 12 are removed. Conventional server cabinet has fans at top of the cabinet. These fans, in this instance, can be removed.

Moreover, the cabinet exhaust fans 51, the cabinet panels 54, and the servers 55 are adapted such that hot air generated from the servers is separated from the cabinet air. This is

different from other cooling systems that do not transfer server heat energy out of a server room but just sends cooling air to absorb heat that is discharged by the server.

- 5 The cabinet exhaust fan 51 uses readings of the temperature monitors 53 to control rotating speed of the cabinet exhaust fan 51. In this way, the cabinet exhaust fan 51 can operate in an intelligent or smart fashion.
- 10 In another example, the servers 55 generated heat energy is discharged for other uses. In one example, the generated heat is channelled for heating of other rooms or for heating water for bathing.
- 15 The cabinet 12 also has a door that opens when temperature inside of the cabinet 12 exceeds a preset value, in an event of cooling system failure. The opened cabinet door allows heat energy within the cabinet 12 to be released away from the servers 55 to the data centre room 11.
- 20 The cooling system 10 can also have a Short Message Service (SMS) capability. An SMS message is sent out in the event of a system failure or for purpose of status update. The appropriate personnel receiving the SMS message can then provide
- 25 the necessary actions.

In a generic sense, the server racks can be adapted such that the servers 55 inside a server rack are separated from each other by gaps of either about 485 millimetres or about 675

30 millimetres. The server racks can have a height of about 205 centimetres, a width of about 60 centimetres, and lengths of about 100 centimetres or 130 centimetres. In some implementations, the server racks have a height of about 872 to about

2285 millimetres, a width of about 600 to 800 millimetres, and a length of about 600 to 900 millimetres. These dimensions can also be more or less for adapting or for accommodating dimensions of the servers 55.

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The servers 55 can have a length of about 450 millimetres, a width of about 700 millimetres, and a height of about 45 millimetres. The servers 55 can also have a length of about 480 millimetres, a width of about 800 millimetres or 400 millimetres, although these dimensions can also be more or less.

The cooling cabinets 12 can have a height of about 910 to about 2325 millimetres, a length of about 640 to 840 millimetres, and a length of about 640 to 940 millimetres. These dimensions can also be more or less for adapting or for accommodating the dimensions of the server rack.

One method of cooling computer servers 55 includes a step of the cooling cabinet 12 being adapted to allow room air to be drawn to the inside of the cabinet 12.

The server exhaust fans are then arranged to draw the cabinet air from one portion of the cabinet 12 to inside of the servers 55 and then to exhaust hot server air to another portion of the cabinet 12. The cabinet exhaust fan 51 later removes essentially the exhausted hot server air out of the data centre room 11. The exhausted hot server air is separate from or does not mix with the cabinet air.

These steps have an advantage of energy savings. This is because the cabinet air is not used to cool the heat that is generated by the server 55. Rather this generated heat is es-

sentially exhausted or drawn away from the servers 55 and is drawn to outside of the data centre room 11.

Fig. 2 shows an improved further embodiment of the improved cooling system. Fig. 2 depicts a further improved cooling system 60. The cooling system 60 includes parts of the cooling system 10 of Fig. 1.

The cooling system 60 includes a cooling cabinet 63 that is placed in the data centre room 11 of Fig. 1. The cooling cabinet 63 houses equipment racks that hold multiple servers 55.

The cooling cabinet 63 has an air inlet 65 and an air outlet 66. A cabinet air conditioning unit 68 is connected to the cabinet air inlet 65 via an air conditioning air outlet 69 and via the floor void 37. The air outlet 66 is connected to the cabinet exhaust fan 51.

In practise, the cooling cabinet 63 shields its inside from air that is in the data centre room 11. The cooling cabinet 63 receives cooling air from the cabinet air conditioning unit 68 via the floor void 37 and via the cabinet air inlet 65. The operational servers 55 receive this cooling air and then exhaust hot air. The cabinet exhaust fan 51 via the cabinet air outlet 66 afterward removes this hot server air to outside the data centre room 11.

Most of the heat energy that is generated by the server 55 is essentially removed from the cabinet 63 via the cabinet exhaust fan 51. The server heat energy is not removed by cooling air from the cabinet air conditioning unit 68. In a special case, the cabinet air conditioning unit 68 does not need

to provide cooling air. Only external ambient air is extracted to the cabinet 63.

One method of cooling computer servers 55 includes a step of drawing cooling air from the cabinet air conditioning unit 68 to the inside of the cabinet 63. Later, the server exhaust fans draw the cabinet air from a portion of the cabinet 12 to inside of the servers 55 and then to exhaust hot server air to another portion of the cabinet 12. The cabinet exhaust fan 51 afterward removes essentially the exhausted hot server air out of the data centre room 11. The exhausted hot server air is separate from or does not mix with the cabinet air.

Fig. 3 shows a third embodiment of the improved cooling system. Fig. 3 depicts a cooling system 75. The cooling system 75 has parts of the cooling system 10 of Fig. 1.

The cooling system 75 has the data centre room 11 of Fig. 1. The room 11 has the room air conditioning unit 23, a separating wall 77, server racks 79, and the exhaust fan 51.

The separating wall 77 partitions the inside of the room 11 into a first part 81 and a second part 82. The server racks 79 holds the servers 55.

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The separating wall 77 has an opening into which the server racks 79 are placed. The separating wall 77 surrounds the server racks 79 such that only a small or no gap exist between the server racks 79 and the wall 77. Any gaps are sealed with a material such as wood or foam. Similarly, the servers 55 are placed on the server racks 79 such that only a small or no gap exist between the servers 55 and the server racks 79. Any gaps are sealed with a material such as wood or

foam. In practise, small gaps may exist but this is not the intention of the embodiment.

The servers 55 can have fans to draw air from the part 81 to the part 82 of the room 11. The air conditioning unit 23 and/or the exhaust fan 51 can also create a higher pressure in the part 81 of the room 11 such that air is drawn from the part 81 to the part 82 of the room 11.

During operation, the first part 81 receives cooling air from the room air conditioning unit 23. The cooling air then flow from the first part 81 to the second part 82 through the server 55. This draws or exhausts hot server air out of the server 55. The exhausted air is then removed from the part 82 using the exhaust fan 55 into an area outside of the room 11.

An air stream that flows from the part 82 to the part 81 of the room 11 is small and is less than an air stream that flows from the part 81 to the part 82 of the room.

The outlet air from the room air conditioning unit 23 can be directed towards the servers 55 for cooling efficiency. The room air conditioning unit 23 can have temperature control for better control of temperature.

Although the above description contains much specificity, these should not be construed as limiting the scope of the embodiments but merely providing illustration of the foreseeable embodiments. Especially the above stated advantages of the embodiments should not be construed as limiting the scope of the embodiments but merely to explain possible achievements if the described embodiments are put into practise. Thus, the scope of the embodiments should be determined by

the claims and their equivalents, rather than by the examples given.

Reference Number

	10	cooling system
	11	data centre room
5	12	cooling cabinet
	15	double ceiling structure
	16	double flooring structure
	17	wall
	20	external air inlet
10	21	room air inlet
	22	room air outlet
	23	room air conditioning unit
	26	base ceiling
	27	suspended ceiling
15	30	ceiling void
	31	external air inlet
	33	base floor
	34	raised floor
	37	floor void 37
20	40	fan coil unit
	41	compressor unit
	42	copper pipe
	43	temperature sensor
	45	hollow pipe
25	51	cabinet exhaust fan
	52	cabinet air tube
	53	temperature monitor
	54	cabinet panel
	55	server
30	56	part
	57	part
	60	cooling system
	63	cooling cabinet

65 air inlet
66 air outlet
68 cabinet air conditioning unit
69 air conditioning air outlet
5 75 cooling system
77 separating wall
79 server rack
81 part
82 part

CLAIMS

1. A room comprising

a room wall that separates air inside the room from
air outside the room,

a room air outlet that connects an inside of the
room with an outside of the room,

a cabinet with an enclosure for receiving at least
one electrical equipment, wherein the enclosure com-
prises a first zone and a second zone, the first zone
providing an equipment space for taking up the at least
one electrical equipment and the second zone being pro-
vided with a cabinet air outlet, the cabinet air outlet
being connected with the room air outlet, and

at least one fan for generating an air stream from
the equipment space to the second zone, from the second
zone to the cabinet air outlet and from the cabinet air
outlet to the room air outlet.

2. A room of claim 1, wherein
the fan is positioned inside the room.

3. A room of claim 1, wherein
the fan is positioned inside the enclosure.

4. A room of claim 1, wherein
the fan is positioned outside the room.

5. A room of one of claims 1 to 4, wherein
the fan comprises at least one temperature monitor for
controlling a rotating speed of the fan.

6. A room of one of claims 1 to 5, wherein

the at least one electrical equipment comprises at least one fan for receiving air from the first zone and for exhausting air to the second zone.

- 5 7. A room of one of claims 1 to 6, wherein
the at least one electrical equipment comprises at least
one computer server.
8. A room of one of claims 1 to 7, wherein
10 the cabinet comprises at least one opening for allowing
room air to be drawn inside of the cabinet.
9. A room of one of claims 1 to 8, wherein
the cabinet further comprises at least one cabinet air
15 inlet.
10. A room of claim 9, wherein
at least one cabinet air inlet receives cooling air from
a cabinet air conditioning unit.
20
11. A room of one of claims 1 to 10, wherein
the cabinet further comprises a door that opens when
cabinet temperature exceeds a pre-determined value.
- 25 12. An equipment cabinet comprising
an enclosure for receiving at least one electrical
equipment, wherein the enclosure comprises
a first zone,
a second zone, the first zone providing an equip-
30 ment space for taking up the electrical equipment and
the second zone being provided with a cabinet air outlet
for connection with a room air outlet, and

means for making sure that an air flow is provided from the first zone to the second zone which is bigger than an air flow from the second zone to the first zone.

- 5 13. A method for cooling an electrical equipment, which is provided in a room, the method comprising
- providing ambient air inside the room that is separated from environmental air outside the room,
- 10 providing an enclosure inside the room, the enclosure providing enclosure air inside the enclosure that is separated from the ambient air in the room,
- providing the electrical equipment in a first zone of the enclosure, and
- 15 generating an enclosure air stream from the equipment to a second zone of the enclosure and from the second zone to the outside of the room.
14. A method of claim 13 further comprising
- cooling of the air stream before the air stream contacts
- 20 the equipment.
15. A method of claim 13 or 14 further comprising
- generating the air stream by suction.