HEATING OR COOLING EQUIPMENT INCLUDING A GEOTHERMAL HEAT PUMP ASSOCIATED WITH AN ARTIFICIAL SNOW PRODUCTION INSTALLATION

Inventor: Max Duplan, Champagne Au Mont D'or (FR)

Correspondence Address:
CLARK & BRODY
1700 Diagonal Road, Suite 510
Alexandria, VA 22314 (US)

Appl. No.: 12/797,731
Filed: Jun. 10, 2010

Related U.S. Application Data
Provisional application No. 61/222,156, filed on Jul. 1, 2009.

Foreign Application Priority Data
Jun. 11, 2009 (FR) ................................. 09 53874

Publication Classification
Int. Cl.
F25C 3/04 (2006.01)
F24F 3/14 (2006.01)
F24H 9/00 (2006.01)

U.S. Cl. ............................... 239/14.2; 165/60; 165/47

ABSTRACT
The invention relates to equipment for alternatively producing either artificial snow or heating or cooling, the equipment comprising:
an artificial snow production installation including in particular a buried pressurized water network;
at least one heat pump having a ground heat exchanger circuit; and
a configuration system for either disconnecting the connection circuit of the heat pump from the buried water network of the artificial snow production installation during a stage of producing artificial snow, or else connecting the connection circuit to the water network of the artificial snow production installation during a stage of heat pump operation, either in heating mode or in cooling mode.
HEATING OR COOLING EQUIPMENT INCLUDING A GEOTHERMAL HEAT PUMP ASSOCIATED WITH AN ARTIFICIAL SNOW PRODUCTION INSTALLATION

FIELD OF THE INVENTION

[0001] The present invention relates to the technical field of producing heating or cooling by using a geothermal heat pump, and more precisely so by means of a geothermal heat pump having an intermediate fluid.

BACKGROUND OF THE INVENTION

[0002] In conventional manner, a heat pump is a thermodynamic machine that serves to transfer heat from a colder medium to a hotter medium. A heat pump using heat from the ground is referred to as a geothermal heat pump.

[0003] In known manner, an intermediate fluid geothermal heat pump has a heat exchange or capture circuit buried in the ground and a conventional refrigerant fluid circuit passing successively in particular through an evaporator, a condenser, and an expander. The evaporator thus exchanges heat between the buried capture circuit and the refrigerant fluid, while the condenser exchanges heat between the refrigerant fluid and an external utilization circuit of any type (floor heating, fan-coil unit, or a low temperature radiator, for example).

[0004] In a variant embodiment, a geothermal heat pump may also be of the reversible type, i.e., it may be capable of transferring heat from the external utilization circuit to the buried capture circuit by transferring heat to the ground. This type of heat pump thus presents, in alternation, a heating operation mode and an air conditioning or cooling operation mode.

[0005] In the state of the art, various applications have been proposed for heat pumps. For example, document EP-A-1 344 996 describes a heat pump in which heat is used in a system for heating buildings or other items, and low temperature is used for conserving a layer of snow that has already formed. Similarly, patent application CA-A-2 599 769 describes an installation in which a heat pump is used both to create ice in a skating rink and to produce hot water. Furthermore, patent EP-A-1 826 514 describes an installation presenting a refrigerant cycle with the hot end being used in a boiler or for heating a building, and the cold end being used for air conditioning a building or for producing ice in a skating rink and/or for cooling air in order to fabricate snow.

[0006] In general manner, geothermal heat pumps are likely to be subjected to considerable development because of the increase in the price of oil and because of ecological preoccupations. Nevertheless, a geothermal heat pump presents operating limitations, in particular because of constraints associated with installing a high performance buried capture circuit using a non-freezable heat transfer fluid, and also associated with the cost of installing it.

OBJECT AND SUMMARY OF THE INVENTION

[0007] The present invention thus seeks to remedy the drawbacks of the state of the art by proposing equipment that is adapted to produce heating or cooling by means of a geothermal heat pump that is provided with a capture or heat exchange circuit that is buried in the ground and that is adapted to present good heat exchange performance while not requiring large amounts of investment.

[0008] To achieve this object, the subject matter of the invention relates to equipment for producing in alternation either artificial snow or heating or cooling by means of a geothermal heat pump.

[0009] To achieve such an object, the alternating production equipment of the invention comprises:

[0010] an artificial snow production installation comprising:

[0011] a buried pressurized water network connected to a supply source and including in particular a set of buried pipes; and

[0012] spray devices for spraying water and air under pressure, the spray devices being connected to the buried pipes by controlled valves and being adapted to form artificial snow;

[0013] at least one heat pump with a ground heat exchanger circuit, the heat exchanger including a refrigerant fluid circuit passing successively in particular through a first heat exchanger, through a compressor, and through a second heat exchanger, the first heat exchanger serving to exchange heat between the refrigerant fluid and a connection circuit connecting to the buried water network of the artificial snow production installation, by means of controlled valves, the second heat exchanger exchanging heat between the refrigerant fluid and an external utilization circuit; and

[0014] a configuration system serving either to disconnect the connection circuit of the heat pump from the buried water network of the artificial snow production installation during the artificial snow production stage, or to act during the heat pump operating stage to form at least one water circulation loop providing the ground heat exchanger circuit of the heat pump and formed by the connection circuit and at least a portion of the buried pipes of the buried water network of the artificial snow production installation.

[0015] Advantageously, the connection circuit includes at least circulator means for circulating water in the water circulation loop, said circulator means being controlled to operate during the heat pump operating stage.

[0016] In a variant embodiment, the heat pump produces heating so that the first heat exchanger operates as an evaporator for the refrigerant fluid so as to absorb heat coming from the water circulation loop, while the second heat exchanger operates to condense the refrigerant fluid so as to deliver heat to the external utilization circuit.

[0017] In another variant embodiment, the heat pump performs cooling so that the first heat pump operates to condense the refrigerant fluid so as to deliver heat to the water circulation loop, while the second heat exchanger operates to evaporate the refrigerant fluid so as to absorb heat coming from the external utilization circuit.

[0018] In another variant embodiment, the heat pump is reversible so that the first heat exchanger operates to evaporate the refrigerant fluid so as to absorb heat coming from the water circulation loop during heating mode, and to condense the refrigerant fluid so as to deliver heat to the water circulation loop during cooling mode, while the second heat exchanger operates to condense the refrigerant fluid so as to deliver heat to the external utilization circuit during heating mode, and to evaporate the refrigerant fluid so as to absorb heat coming from the external utilization circuit during cooling mode.
In another variant embodiment, the heat pump includes as first and second heat exchangers, a condenser and an evaporator, while the external utilization circuit and the ground heat exchanger circuit include means for swapping over exchanges between said circuits and the condenser and the evaporator.

According to another characteristic of the invention, the configuration system enables the valves of the connection circuit and the valves fitted to buried pipes of the artificial snow production installation to be controlled in dependence on the operating stage.

Advantageously, the configuration system serves automatically to control the valves of the connection circuit and the valves fitted to the buried pipes of the artificial snow production installation.

Another object of the invention is to provide a method of producing in alternation either artificial snow or heating or cooling by means of production equipment.

According to the invention, while the artificial snow production installation is stopped, at least a portion of the buried water network of the artificial snow production installation is used to form the ground heat exchanger circuit of the heat pump.

Advantageously, this alternating production method consists in forming the ground heat exchanger circuit by adding connection pipes and/or valves thereto.

BRIEF DESCRIPTION OF THE DRAWINGS

Various other characteristics appear from the following description given with reference to the accompanying drawings that show embodiments of the invention as non-limiting embodiments.

FIG. 1 is a diagrammatic view of alternating production equipment in accordance with the invention.

FIG. 2 is a diagram of the alternating production equipment in accordance with the invention during a stage of producing artificial snow.

FIG. 3 is a diagram of the alternating production equipment during a stage of producing heating or cooling.

MORE DETAILED DESCRIPTION

As can be seen more clearly in FIG. 1, the production equipment 1 of the invention comprises an artificial snow production installation I together with at least one geothermal heat pump II, there being only one pump in the example shown. The production equipment also includes a coupling circuit III between the artificial snow production installation I and the geothermal heat pump II.

The production equipment 1 of the invention is thus adapted to produce in alternation either artificial snow during a stage of producing artificial snow by means of the production installation I, or else heating or cooling during a stage of operating the heat pump II using some of the equipment of the artificial snow production installation I, as explained below in the description.

The artificial snow production installation I includes in particular a buried pressurized water network 2 connected to a supply source 3 of any type such as a catchment, a hillside reservoir, a lake, a water table, etc. This buried pressurized water network 2 includes in particular a set of buried pipes 4 that are distributed in the ground at a depth of about 1.20 meters. In conventional manner, these buried pipes 4 are generally made of metal, i.e. they are tubes of steel or cast iron. Naturally, all or some of the buried pipes 4 may be made using other materials such as polyethylene or composite materials.

It should be observed that the buried pressurized water network 2 may present numerous configurations that depend on the number and the distribution of the runs or areas to be covered in snow. In the embodiment shown diagrammatically in FIG. 1, the buried pressurized water network 2 comprises a set of buried pipes 4 distributed, as shown, in first, second, third, and fourth branches A, B, C, and D connected in parallel with one another and connected at one end to a first common branch E and at the other end to a second common branch F.

The buried pressurized water network 2 also includes a pressurization system P1, P2 for pressurizing the water within the buried pipes 4. In the example shown, the pressurization system P1, P2 comprises a first pump P1, and a second pump P2 having their inlets connected to the supply source 3. The outlets from the pumps P1 and P2 are connected to the first common branch E of the buried pipes 4 to cause pressurized water to flow inside all of the buried pipes 4. In the example shown, the outlets from the first and second pumps P1, P2 are connected to the first common branch E of the buried pipes 4, respectively between the first and second branches A and B, and between the third and fourth branches C and D. The pumps P1 and P2 are adapted to pressurize the water to a high pressure or to a low pressure. It should be observed that the system for pressurizing the water within the buried pipes 4 may be different, for example it may be of the gravity type.

In conventional manner, the buried pressurized water network 2 may also have controlled valves V (where i=1 to n) enabling the supply of water to the various buried pipes 4 to be controlled selectively.

These controlled valves V are distributed over the buried pressurization water network 2 as a function of which portions of the buried pipes are or are not to be fed with water. These controlled valves V may be of any known type suitable for opening or closing the pipes, and they may be of the manual type. Preferably, these controlled valves V are controlled automatically using a remote centralized control system 5.

In the example shown, the buried pressurized water network 2 comprises:

- a first controlled valve V1 connected in the second common branch B between the second branch B and the third branch C of the buried pipes 4;
- a second controlled valve V2 connected in the first common branch E between the second branch B and the third branch C of the buried pipes 4;
- a third controlled valve V3, connected at the outlet from the supply source 3, upstream from the inlet of the pumps P1, P2; and
- a fourth controlled valve V4 and a fifth controlled valve V5 connected respectively to the outlet from the first pump P1 and to the outlet from the second pump P2, upstream from the first common branch E of the buried pipes 4.

This artificial snow production installation I also includes spray devices 6 for spraying water and air under pressure that are connected to the buried pipes 4 via isolating controlled valves 7. These spray devices 6 are adapted to ensure the formation of artificial snow and they may be snow generators of any known type, e.g. single fluid snow genera-
tors, dual fluid (water and air) snow generators, fans, etc., operating either at high pressure or at low pressure. These spray devices 6 are not described in greater detail since they are well known to the person skilled in the art. In this respect, it should be observed that the optional compressed air network for feeding the spray devices 6 is not shown in the figures for reasons of simplification.

The spray devices 6 are thus fed in particular with the water under pressure flowing in the buried pipes 4. The feed of water under pressure to the spray devices 6 is controlled by the isolating controlled valves 7 that may be of any known type. These isolating controlled valves 7 are controlled manually, or preferably automatically using the remote centralizer control system 5.

The production equipment 1 of the invention also includes at least one heat pump II including in particular a refrigerant fluid circuit 10 where the refrigerant fluid is caused to circulate in succession through a first heat exchanger 11, a compressor 12, a second heat exchanger 13, and an expander 14. The refrigerant fluid circulates in the heat pump II in which it is subjected to a transformation cycle that is not described in greater detail since it is well known to the person skilled in the art.

The heat pump II conventionally also includes an external utilization circuit 16 of any known type. This external utilization circuit 16 is associated with the second heat exchanger 13 that exchanges heat between the refrigerant fluid and the external utilization circuit 16.

This geothermal type heat pump II also includes a circuit 19 for exchanging heat with the ground that is described below in greater detail with reference to FIG. 3. This ground heat exchange circuit 19 is associated with the first heat exchanger 11 that exchanges heat between the refrigerant fluid and the ground heat exchange circuit 19. It should be observed that the heat pump II is adapted to operate in a single operating mode, i.e. either in a cooling or air conditioning mode, or else in a heating mode. The heat pump II may be of the reversible type so that it can operate alternatively either in a cooling mode or in a heating mode.

It should be observed that the heat pump II is shown diagrammatically for reasons of simplification, it being considered that a heat pump of the reversible type is likewise well known.

When the heat pump II is operating in heating mode, the first heat exchanger 11 is an evaporator or functions as an evaporator to evaporate the refrigerant fluid of the circuit 10 so as to absorb the heat coming from the ground heat exchange circuit 19, while the second heat exchanger 13 is a condenser or functions as a condenser to condense the refrigerant fluid of the circuit 10 so as to deliver heat into the external utilization circuit 16. The external utilization circuit 16 may be of any type and may behave as a heating emitter, a heating floor, a fan-coil unit, or a low temperature radiator, for example.

When the heat pump II is operating in cooling or air conditioning mode, the second heat exchanger 13 is an evaporator or acts as an evaporator to evaporate the refrigerant fluid of the circuit 10 in such a manner as to absorb the heat coming from the external utilization circuit 16, while the first heat exchanger 11 is a condenser or operates as a condenser to condense the refrigerant fluid of the circuit 10 in such a manner as to deliver heat to the ground heat exchanger circuit 19 which returns heat to the ground.

Naturally, instead of interchanging the mode of operation of the first and second heat exchangers 11 and 13, provision may be made to interchange the external utilization circuit 16 and the ground heat exchanger circuit 19 by interchanging the inlet and outlets of the heat exchangers 11, 13. Under such circumstances, the first and second heat exchangers 11 and 13 always operate in respective single modes, e.g. respectively as an evaporator and as a condenser, while the external utilization circuit 16 and the ground heat exchanger circuit 19 include automatic valves for swapping over exchanges between said circuits and the condenser and the evaporator.

According to a characteristic of the invention, the ground heat exchanger circuit 19 includes at least a portion of the buried pressurized water network 2 of the artificial snow production installation 1. In other words, all or part of the buried pressurized water network 2 of the artificial snow production installation 1 serves to form at least part of the ground heat exchanger circuit 19 of the geothermal heat pump II.

In accordance with the invention, the production equipment 1 includes a connection circuit III connecting the heat pump II with the buried pressurized water network 2 of the artificial snow production installation 1. This connection circuit III co-operates with at least a portion of the buried pressurized water network 2 to form the ground heat exchanger circuit 19 of the heat pump II.

The connection circuit III includes pipes 21, 22 that are optionally buried and that are provided with controlled connection valves U i (with i=1 to 2 in the example shown). The connection circuit III is associated with the first heat exchanger 11 and, in the example shown it includes, beside the outlet from the heat exchanger 11, a go pipe 21 fitted with a first controlled connection valve U 1, leading to the first common branch E between the first and second branches A and B of the buried pipes 4. The connection circuit III includes, beside the inlet to the first heat exchanger 11, a return pipe 22 fitted with a second controlled connection valve U 2, leading to the first common branch E between the third and fourth branches C and D of the buried pipes 4. Naturally, the heat pump II may be connected by means of the connection circuit III to any portion of the buried pressurized water network 2. Thus, in the example of FIG. 1, the go and return pipes 21 and 22 may be connected to the second common branch F between firstly the first and second branches A and B and secondly the third and fourth branches C and D.

The connection circuit III also includes circulator means 23 for circulating the water in the water circulation loop 19. For example, the water circulator means 23 may be constituted by a circulator.

The production equipment 1 also includes a configuration system 30 serving either to disconnect the heat pump II from the buried pressurized water network 2 of the artificial snow production installation 1 during a stage of producing artificial snow, or, during an operating stage of the heat pump II, to create or form the ground heat exchanger circuit 19 in the form of at least one water circulation loop made up of the connection circuit III and at least some of the buried pipes 4 of the buried pressurized water network 2 of the artificial snow production installation 1. In other words, the configuration system 30 makes it possible to run, control, or switch the production equipment 1 from a stage of producing artificial snow with the production installation 1 to a stage of operating the heat pump II together with the ground heat.
exchanger circuit 19 that includes at least some of the buried pipes 4 of the artificial snow production installation 1. Naturally, the configuration system 30 is adapted to enable the production equipment 1 to switch in the opposite direction from the stage of heat pump operation to the stage of producing artificial snow.

[0055] The configuration system 30 serves to control the connection valves U₁, U₂ in order to disconnect or connect the heat pump II with the buried water network 2. The configuration system 30 also makes it possible to create the ground heat exchanger circuit 19 by making best use of the buried pipes 4. Thus, in the event of the buried water network 2 being provided with controlled valves Vₓ, then the configuration system 30 is adapted to enable these buried valves Vₓ to be controlled so as to set up at least one water circulation loop. It is possible to use only some of the buried water network 2 or to add additional controlled valves Vₓ and/or additional pipes. These additional pipes and/or additional controlled valves are considered as forming parts of the connection circuit III. It should be observed that the configuration system 30 enables the various valves Vₓ, U₁ to be controlled manually, or preferably automatically. During automatic control, the configuration system 30 is preferably servo-controlled to the remote centralized control system 5 forming part of the artificial snow production installation 1, in particular for safety reasons and to avoid redundancy in the controls. In other words, the remote centralized control system 5 may be a master system with one of its slave systems being the configuration system 30. Functions of the configuration system 30 may also be provided by the remote centralized control system 5.

[0057] The operation of the production equipment 1 as shown stems directly from the above description.

[0058] When artificial snow production is needed, the artificial snow production installation 1 operates with the heat pump II off. During this stage of producing artificial snow, the control system 30 closes the controlled valves U₁ and U₂ so as to disconnect the heat pump II from the artificial snow production installation 1. Naturally, the circulator 23 is off.

[0059] During this stage of producing artificial snow, the artificial snow production installation 1 is connected so as to enable it to provide artificial snow. In this respect, the pumps P₁ and P₂ and the artificial snow connected pipes 30 are open while the first and second valves V₁ and V₂ are closed. The flow of water in the buried pipes 4 is represented diagrammatically in FIG. 2. The pumps P₁ and P₂ thus deliver water from the supply source 3 to the various branches A, B, C, D, E, and F that are fitted with spray devices 6. All or some of the isolation valves 7 are open so as to enable artificial snow to be produced.

[0060] When there is no longer any need to produce artificial snow, the artificial snow production installation 1 is switched off. The isolation valves 7 are closed, the pumps P₁ and P₂ are stopped, and the third, fourth, and fifth valves V₃, V₄, and V₅ are closed. It should be observed that the buried pressurized water network 2 remains full.

[0061] While artificial snow production is stopped, it may be advantageous to produce either heat or cooling by means of the geothermal heat pump II.

[0062] During a stage in which the heat pump II is in operation, the heat pump II is running and the configuration system 30 enables the first and second connection valves U₁ and U₂ to be opened so as to connect to the connection network III connecting to the buried pressurized water network 2. The configuration system 30 controls the controlled valves Vₓ so as to use at least some of the buried pipes 4 in order to form at least one water circulation loop 19.

[0063] As can be seen more clearly in FIG. 3, the first valve V₁ is open and the second valve V₂ is closed while the third, fourth, and fifth valves V₃, V₄, and V₅ remain closed. The configuration system 30 enables the circulator 23 to be put into operation to cause water to circulate in the water circulation loop 19. As can be seen clearly from FIG. 3, after passing through the heat exchanger 11, the water flows through the go pipe 21 and then via the first common branch E, into the first and second branches A and B. The water then passes through the first valve V₁ to flow subsequently in parallel in the third and fourth branches C and D. The water recovered by the first common branch E is then taken by the return pipe 22 to the circulator 23 which serves to send the water back into the go pipe 21, after passing through the heat exchanger 11.

[0064] The water circulation loop 19 thus enables heat to be taken from the ground while the heat pump II is operating in heater mode, this heat being conveyed to the first heat exchanger 11. When the heat pump II is operating in cooling or air conditioning mode, the water circulation loop 19 serves to return to the ground the heat supplied by the external utilization circuit 16 via the second heat exchanger 13 and the first heat exchanger 11.

[0065] From the above description, it can be seen that without affecting the operation of the artificial snow production installation 1, it is possible to produce heating or cooling with a geothermal heat pump, and with a considerable reduction in investment since the ground heat exchanger circuit is put into place when installing the artificial snow production installation 1.

[0066] From the above description, it can be seen that automatic switch-over from the artificial snow production stage to the heating or cooling production stage enables advantage to be taken of the heat pump as soon as the artificial snow production installation 1 has been stopped, and conversely it should be observed that switching over operation does not give to any hydraulic or thermal shock in the production equipment 1.

[0067] Furthermore, the buried water network 2 comprises buried pipes that are generally made of metal and of large diameter therefore encouraging heat exchange between the water and the ground, thereby enabling a considerable reduction in the area of tubing required for exchanging heat per square meter of ground. This solution offers the advantage of using only water as the refrigerant fluid in the ground heat exchanger circuit 19, without it being necessary to add any additive such as glycol, etc.

[0068] In the example shown in the figures, the entire buried water network 2 is used in the ground heat exchanger circuit 19. Naturally, as a function of the configuration of the buried water network 2, it may be possible to use only a portion of the buried water network 2, possibly with the need to add pipes and/or controlled valves, as mentioned above.

[0069] In this respect, it is mentioned above that artificial snow production is an alternative to the heat pump II being operated. Naturally, depending on the structure of the buried network 2, it is possible to envisage splitting the buried water network 2 into several portions, with one of the portions operating to produce artificial snow while another portion that is not being used to produce artificial snow then being suitable for use in the context of the heat pump being in operation. In
other words, the same buried pipe 4 cannot be used simultaneously for producing artificial snow and for heating or cooling. However, some of the buried pipes 4 may be used for producing artificial snow while other buried pipes 4 are being used for heat pump operation.

[0070] It should be observed that the cooling of the ground during operation of the heat pump II enhances subsequent production of artificial snow by cooling the water in the buried pipes 4 before it reaches the spray devices 6. In the same manner, artificial snow production operation using water at a higher temperature leads to the ground being heated, and that enhances subsequent heat pump operation.

[0071] The invention is not limited to the examples described and shown since various modifications can be made thereto without going beyond its ambit.

What is claimed is:

1. Equipment for producing in alternation either artificial snow or heating or cooling, wherein the equipment comprises:

an artificial snow production installation comprising:

- a buried pressurized water network connected to a supply source and including in particular a set of buried pipes; and

- spray devices for spraying water and air under pressure, the spray devices being connected to the buried pipes by controlled valves and being adapted to form artificial snow;

- at least one heat pump with a ground heat exchanger circuit, the heat exchanger including a refrigerant fluid circuit passing successively in particular through a ring heat exchanger, through a compressor, and through a second heat exchanger, the first heat exchanger serving to exchange heat between the refrigerant fluid and a connection circuit connecting to the buried water network of the artificial snow production installation, by means of controlled valves, the second heat exchanger exchanging heat between the refrigerant fluid and an external utilization circuit; and

- a configuration system serving either to disconnect the connection circuit of the heat pump from the buried water network of the artificial snow production installation during the artificial snow production stage, or to act during the heat pump operation stage to form at least one water circulation loop providing the ground heat exchanger circuit of the heat pump and formed by the connection circuit and at least a portion of the buried pipes of the buried water network of the artificial snow production installation.

2. Equipment according to claim 1, wherein the connection circuit includes at least circulator means for circulating water in the water circulation loop, said circulator means being controlled to operate during the heat pump operating stage.

3. Equipment according to claim 1, wherein the heat pump produces heating so that the first heat exchanger operates as an evaporator for the refrigerant fluid so as to absorb heat coming from the water circulation loop, while the second heat exchanger operates to condense the refrigerant fluid so as to deliver heat to the external utilization circuit.

4. Equipment according to claim 1, wherein the heat pump performs cooling so that the first heat pump operates to condense the refrigerant fluid so as to deliver heat to the water circulation loop, while the second heat exchanger operates to evaporate the refrigerant fluid so as to absorb heat coming from the external utilization circuit.

5. Equipment according to claim 1, wherein the heat pump is reversible so that the first heat exchanger operates to evaporate the refrigerant fluid so as to absorb heat coming from the water circulation loop during heating mode, and to condense the refrigerant fluid so as to deliver heat to the water circulation loop during cooling mode, while the second heat exchanger operates to condense the refrigerant fluid so as to deliver heat to the external utilization circuit during heating mode, and to evaporate the refrigerant fluid so as to absorb heat coming from the external utilization circuit during cooling mode.

6. Equipment according to claim 1, wherein the heat pump includes as first and second heat exchangers, a condenser and an evaporator, while the external utilization circuit and the ground heat exchanger circuit include means for swapping over exchanges between said circuits and the condenser and the evaporator.

7. Equipment according to claim 1, wherein the configuration system serves automatically to control the valves of the connection circuit and the valves fitted to buried pipes of the artificial snow production installation to be controlled depending on the operating stage.

8. Equipment according to claim 7, wherein the configuration system serves automatically to control the valves of the connection circuit and the valves fitted to the buried pipes of the artificial snow production installation.

9. A method of alternatively producing either artificial snow or heating or cooling by means of production equipment, wherein, while the artificial snow production installation is stopped, at least a portion of the buried water network of the artificial snow production installation is used to form the ground heat exchanger circuit of the heat pump.

10. An alternating production method according to claim 9, wherein it consists in forming the ground heat exchanger circuit by adding connection pipes and/or valves thereto.

* * * * 