been completed, the heat source facility that has been already installed in the existing building is replaced and renewed to the regional heat supply system. In this case, the existing heat source facility becomes unnecessary, so that when the heat source facility is still sufficiently usable, the demand for substituting the heat source facility for the regional heat supply system is low. Also, it is conceivable that the buildings whose renewal for the heat source facility is due are sequentially connected to the regional heat supply system, but it is not easy for the existing heat supply system to arbitrarily connect with the new buildings because heat supply facilities in accordance with the demands in the region supplied are provided in the conventional regional heat supply system.

[0013] On the other hand, in the existing region where the heat sources that are independent from each other are included in the buildings, it is necessary to generate the heat energy not to be short of the heat energy in the respective buildings. Accordingly, under the present circumstances, each heat source is operated at a low efficiency, or excessive heat energy is generated in order to perform a high efficient operation, which leads to a low energy efficiency in the region as a whole.

[0014] Embodiments of the present invention provide a heat energy transport system, a heat interchange system, and a heat energy transport method, which can exceedingly effectively utilize the hear energy generated in a region and can be easily applied to the existing buildings.

Solution to Problem

[0015]

According to a first aspect of the present invention, there is provided a heat energy transport system comprising: a heat medium transport path in which heat media that transport heat energy are transported; a heat source configured to be connected to the heat medium transport path and supply the heat energy to the heat medium transport path; a heat demand end configured to be connected to the heat medium transport path and take out the heat energy from the heat medium transport path; a temperature distribution acquisition means configured to acquire temperature distribution of the heat media that have temperatures being different from each other in the heat medium transport path and that are sequentially transported in a state of having a predetermined length in a transport direction in the heat medium transport path; and a control means configured to receive a load request of the heat demand end and, when a heat medium having the heat energy that satisfies the load request received reaches the heat demand end that makes the load request based on the temperature distribution acquired by the temperature distribution acquisition means, configured to cause the heat demand end to take out the heat energy from the heat medium reached.

[0016] In the heat energy transport system, a mass of heat media having different temperatures are transported in the heat medium transport path. That is, the heat energy can be transported in a state where the heat media to which the different heat energy is applied coexist in the heat medium transport path. Accordingly, for example, the heat energy that

becomes redundant in the building connected to the heat interchange system or the heat energy that remains after being used in the building can be arbitrarily transported to other buildings. Consequently, the small amount of heat energy, which has been conventionally discarded, and waste heat can be effectively utilized. As a result, a primary side energy of the heat source can be exceedingly reduced. Also, heat energy suppliers and heat energy users are easily identified, so that charge can be relatively easily carried out.

[0017] Regarding the above-mentioned constitution, the constitution can be adopted such that the control means causes the heat source to supply the heat medium having the heat energy that satisfies the load request received. With this constitution, the constitution can be adopted such that, when a plurality of heat sources are connected to the heat medium transport path, the control means specifies the heat source, by which the heat energy is supplied, based on the operational state of each heat source.

[0018] Also, with the above-mentioned constitution, the constitution can be adopted such that the heat medium transport path is annularly formed, and the heat medium is not taken out

from the heat medium transport path with regard to the heat source and the heat demand end, and only the heat energy is given to and received from the heat media. Also, the constitution can be adopted such that the heat medium transport path includes an annular first transport path and an annular second transport path, and the heat source and the heat demand end include a buffer tank that accumulates the heat medium taken out from the first transport path or the second transport path. In this case, the heat energy is given to and received from the heat medium accumulated in each of the buffer tanks. Furthermore, the constitution can be adopted such that the heat medium transport path includes the annular first transport path and the annular second transport path, and the heat source and the heat demand end include a buffer tank that accumulates intermediate heat medium through which the heat energy is given to and received from the heat media transported through the heat medium transport path. In this case, the heat energy is given and received between the heat medium used in the heat source and the heat demand end and the intermediate heat medium accumulated in each of the buffer tanks.

[0019] On the other hand, from another viewpoint, embodiments of the present invention can provide a heat interchange system in which the heat energy is interchanged in the region.

According to a second aspect of the present invention, there is provided a heat interchange system comprising: a first building configured to include at least one air conditioner; a second building configured to include at least one heat source; a heat medium transport path configured to be arranged between the first building and the second building, the heat medium transport path in which heat media that transport heat energy are transported; a temperature distribution acquisition means configured to acquire temperature distribution of the heat media that have temperatures being different from each other in the heat medium transport path and that are sequentially transported in a state of having a predetermined length in a transport direction in the heat medium transport path; and a control means configured to receive a load request of the air conditioner of the first building, and when a heat medium having the heat energy that satisfies the load request received reaches the first building based on the temperature distribution acquired by the temperature distribution acquisition means, configured to cause the first building to take out the heat energy from the heat medium reached and configured to cause the air conditioner to use the heat energy taken out.

[0020] In the heat interchange system, a mass of heat media having different temperatures is transported in the heat medium transport path. That is, the heat energy can be transported in a state where the heat media to which the different heat energy is applied coexist in the heat medium transport path. Accordingly, for example, the heat energy that becomes redundant in the building connected to the heat interchange system or the heat energy that remains after being used in the building can be arbitrarily transported to other buildings. Consequently, the small amount of heat energy, which has been conventionally discarded, and waste heat can be effectively utilized. As a result, the primary side energy of the heat source can be exceedingly reduced. Also, heat energy suppliers and heat energy users are easily identified, so that charge can be relatively easily carried out.

[0021] With the above-mentioned constitution, the constitution can be adopted such that the control means causes the heat source included in the second building to supply the heat

medium having the heat energy that satisfies the load request received. With this constitution, the constitution can be adopted such that, when a plurality of buildings, each of which includes the heat source, are connected to the heat medium transport path, and the control means specifies the second building, from among the plurality of buildings, based on an operational state of the heat source of each building.

[0022] Also, with the above-mentioned constitution, the constitution can be adopted such that the heat medium transport path includes an annular first transport path and an annular second transport path, and the first building and the second building include a buffer tank that accumulates the heat medium taken out from the first transport path or the second transport path. In this case, the heat energy is given to and received from the heat medium accumulated in each of the buffer tanks.

[0023] Regarding the heat interchange system, the constitution can be adopted such that a plurality of buildings, each of which includes the buffer tank that accumulates the heat medium taken out from the first transport path or the second transport path, are connected to

In this case, when an intermediate heat medium having the heat energy that satisfies the load request received is accumulated in the buffer tank included in any of the plurality of buildings, and use of the intermediate heat medium in the buffer tank is not decided, the control means specifies the building and the buffer tank as the second building and the heat source. Also, a plurality of buffer tanks mentioned above is arranged in each building.

[0028] Also, with the above-mentioned constitution, the first building can include a common heat exchanger that carries out heat exchange between the heat media transported through the heat medium transport path and the intermediate heat medium, heat exchange between the heat media transported through the heat medium transport path and heat medium for the air conditioner, and heat exchange between the intermediate heat medium and the heat medium for the air conditioner. Similarly, the second building can include a common heat exchanger that carries out heat exchange between the heat media transported through the heat medium transport path and the intermediate heat medium, heat exchange between the heat media transported through the heat medium transport path and heat medium for the heat source, and heat exchange between the intermediate heat medium and the heat medium for the heat source.

[0029] Furthermore, from another viewpoint, embodiments of the present invention can provide a heat energy transport method.

According to a third aspect of the present invention, there is provided a heat energy transport method comprising: a step for receiving a load request; a step for acquiring temperature distribution of heat media that have temperatures being different from each other in a heat medium transport path, in which the heat media that transport heat energy are transported, and that are sequentially transported in a state of having a predetermined length in a transport direction in the heat medium transport path; a step for specifying a mass of heat medium having the heat energy that satisfies the load request received, based on the temperature distribution; a step for transporting the mass of heat medium specified to a request source of the load request through the heat medium transport path; and a step, when the mass of heat medium specified reaches the request source of the load request, for taking out the heat energy from the heat medium reached.

[0030] In the heat energy transport method, the mass of heat media having different temperatures is transported in the heat medium transport path. That is, the heat energy can be transported in a state where the heat media to which the different heat energy is applied coexist in the heat medium transport path. Accordingly, for example, the heat energy that becomes redundant in the building connected to the heat energy transport system or the heat energy that remains after being used in the building can be arbitrarily transported. Consequently, the small amount of heat energy, which has been conventionally discarded, and waste heat can be effectively utilized. As a result, the primary side energy of the heat source can be exceedingly reduced. Also, heat energy suppliers and heat energy users are easily identified, so that charge can be relatively easily carried out.

[0031] In the heat energy transport method, the constitution can be adopted such that, regarding the step for specifying the mass of heat medium having the heat energy that satisfies the load request received, based on the temperature distribution, when the mass of heat medium having the heat energy that satisfies the load request received cannot be specified, the mass of heat medium having the heat energy that satisfies the load request is generated in the heat medium transport path by mean of a heat source connected to the heat medium transport path. Also, the constitution can be adopted such that, regarding the step for specifying the mass of heat medium having the heat energy that satisfies the load request received, based on the temperature distribution, when the mass of heat medium having the heat energy that satisfies the load request received cannot be specified, the mass of heat medium having the heat energy that satisfies the load request is generated in the heat medium transport path by means of remaining heat energy whose part is consumed in other building connected to the heat medium transport path.

Advantageous Effects of Invention

[0032] According to embodiments of the present invention, the heat energy generated in the buildings that include the heat source can be effectively utilized in the region. Also, the heat medium is supplied to a certain building, and after the heat energy included in the heat