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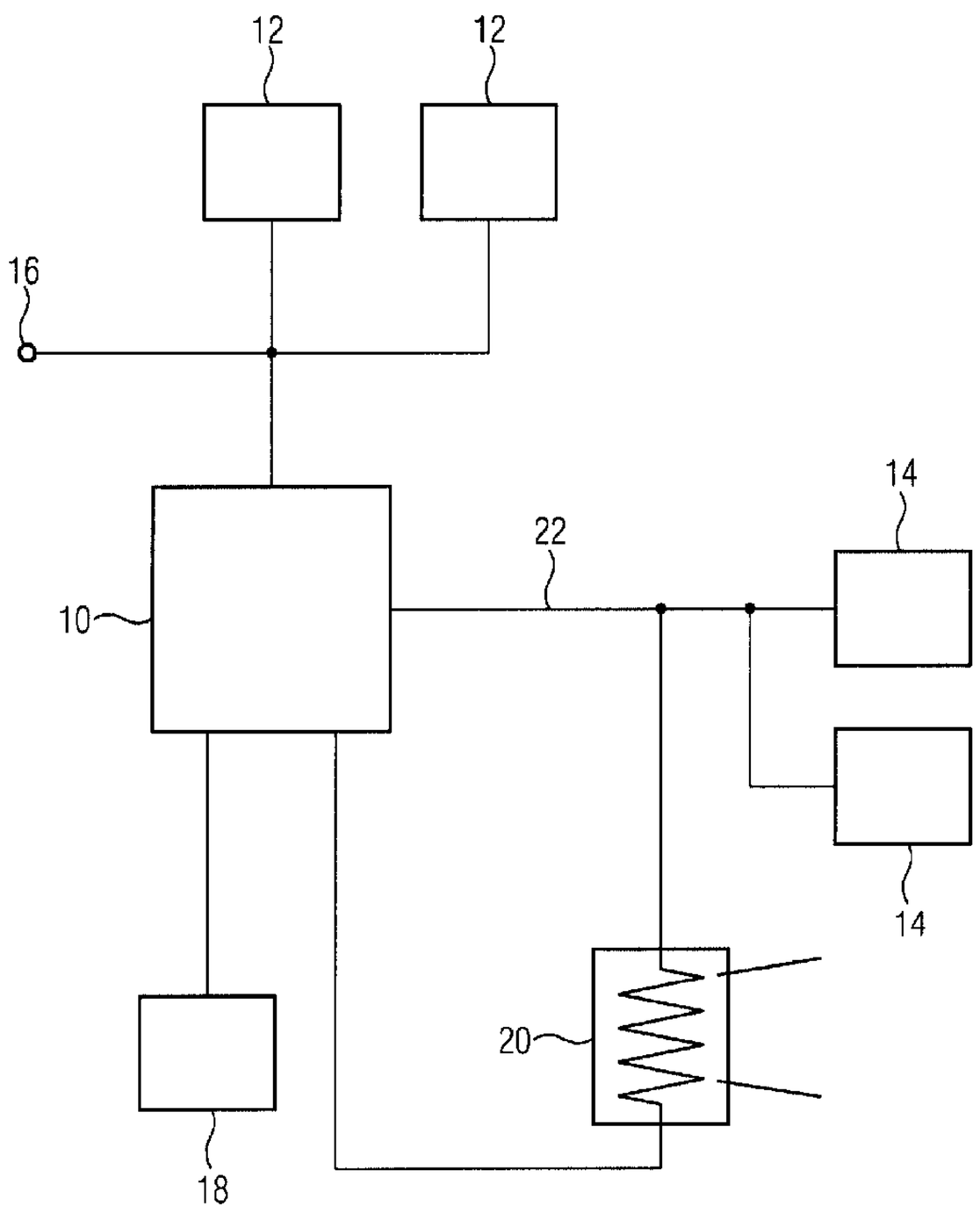

(57) Abrégé/Abstract:
Electrical and thermal energy is generated for at least one load by a combined heat and power plant, wherein the retrieved heat output is increased when a threshold value for a difference between a provided and retrieved heat output is exceeded.

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ABSTRACT

COMBINED HEAT AND POWER PLANT AND METHOD FOR OPERATION THEREOF

Electrical and thermal energy is generated for at least one load by a combined heat and power plant, wherein the retrieved heat output is increased when a threshold value for a difference between a provided and retrieved heat output is exceeded.

Combined heat and power plant and method for the operation thereof

FIELD OF INVENTION

The invention relates to a method for operating a combined heat and power plant and a combined heat and power plant.

BACKGROUND

Combined heat and power plants, which simultaneously provide electrical energy and heat, are becoming increasingly important for supplying energy, firstly because they typically are very efficient and hence have low consumption and emission values, and secondly because they can be used to compensate fluctuations in the feed-in of renewables.

Combined heat and power plants are usually operated either in a heat-operated or power-operated mode, depending on which demand determines the regulation of the combined heat and power plant. It is known here, in cases where there is a greater demand for electricity than for heat, to temporarily store the excess heat generated in corresponding stores so that the heat and the electricity can be utilized asynchronously. However, the typical sizes of store here enable the combined heat and power plant to operate without a thermal load for only a few hours. If, when a store is full, there is still no thermal load, then such a combined heat and power plant must, as necessary and despite the continuing demand for electricity, adjust its operating mode because of insufficient cooling. When a combined heat and power plant is used in conjunction with electricity networks with a high degree of photovoltaic generation or use

of wind power, it can now be the case that particularly high electrical loads are required by the combined heat and power plant without the heat which is generated at the same time being removed. Because of the limited size of the stores, after just a few hours of rain or a few hours of no wind, failure of the combined heat and power plant may therefore occur, so that stand-by power must additionally be maintained which can be used in this eventuality.

However, this is not advisable from either an operational or economic perspective.

SUMMARY

The object of some embodiments of the present invention is to provide a method for operating a combined heat and power plant, and a combined heat and power plant which enable combined heat and power plants to operate particularly flexibly even when the demand for the thermal energy generated is low.

In such a method for operating a combined heat and power plant for providing electrical and thermal energy for at least one consumer unit, it is provided according to some embodiments of the invention that the heat output requested is increased when a threshold value for a difference between provided and requested heat output is exceeded.

In other words, within the scope of the method according to some embodiments of the invention, an additional artificial demand for heat is created for the case where the demand for electricity significantly exceeds the current demand for heat. As a result, the load on heat stores which may be used can be

relieved so that the electrical energy requested can be reliably provided even for relatively long periods of time without the heat storage capacity of the combined heat and power plant being fully utilized.

Even when there is a high demand for electricity at the same time as a low requested heat output, the electricity can thus be reliably provided without there being any need for additional stand-by capacity to be activated.

The method thus enables the power plant to operate particularly economically, in particular in an electrical network with a high number of stochastically fluctuating generators.

To increase the heat output requested, it is possible to simply dissipate a proportion of the heat output provided, i.e. to discharge it into the environment. For this purpose, a heat exchanger can, for example, be provided which is coupled to the surrounding air and/or to the soil and/or to a water reservoir. The dissipated energy is thus wasted, i.e. is not reclaimed as in the case of a heat store. Specific implementations of this are, for example, a dry or wet recooling, the discharge of heat to stationary or running water or to an opened cooling water circuit, the heated cooling water being disposed of.

It is moreover possible to increase the amount of heat requested by increasing the heat consumption of the at least one consumer unit. To do this, for example, a set heating temperature for a room, a swimming pool or the like can, be increased, or also the lowering of the nighttime temperature of a heating system can be suspended. The heat consumption is thus increased here via an energy management system, wherein the increase expediently is selected such that a comfort threshold for users is not exceeded despite the rooms, swimming pool, or the like being heated more intensely.

Furthermore, a further consumer unit can be activated in order to increase the heat consumption. Processes with a high thermal energy requirement, for example heating procedures, cleaning procedures, or the like can therefore, for example, be conducted ahead of schedule, or alternatively rooms which are not per se needed immediately can be heated additionally in order thus to remove the excess heat.

Some embodiments of the invention furthermore relate to a combined heat and power plant for providing electrical and thermal energy for at least one consumer unit which comprises a first heat exchanger by means of which heat can be transferred from a heat source of the combined heat and power plant to a heat distribution network. According to some embodiments of the invention, it is moreover provided that at least one further heat exchanger is thermally coupled to the combined heat and power plant, by means of which heat can be discharged to the environment when a threshold for a difference between a provided and a requested heat output is exceeded.

As already described with reference to the method according to some embodiments of the invention, when there is a high demand for electrical energy and simultaneously a low demand for heat energy, in this way excess generated heat can be dissipated to the environment so that the generation of electrical energy can be continued without the combined heat and power plant overheating owing to the excessively low heat removal. For this purpose, as already described, it is advantageous to couple the further heat exchanger to the surrounding air and/or to the soil and/or to a water reservoir in order to allow even large quantities of heat to be reliably removed.

According to one aspect of the present invention, there is provided a method for operating a combined heat and power plant for providing electrical and thermal energy for at least one consumer unit, comprising: increasing requested heat output when a threshold value for a difference between provided heat output and the requested heat output is exceeded, wherein the requested heat output is increased by dissipating a proportion

of the heat output provided wherein the dissipation is effected by means of a heat exchanger coupled to surrounding soil.

According to another aspect of the present invention, there is provided a combined heat and power plant, located in an environment, for providing electrical and thermal energy for at least one consumer unit via a heat distribution network, comprising: a heat source; a first heat exchanger by which heat is transferred from the heat source to the heat distribution network; and at least one additional heat exchanger by which heat is discharged to the environment when a threshold for a difference between a provided heat output and a requested heat output is exceeded wherein the at least one additional heat exchanger exchanges heat with surrounding soil.

BRIEF DESCRIPTION OF THE DRAWING

The invention and its embodiments are explained in detail below with reference to Fig. 1. Figure 1 hereby shows a schematic representation of an exemplary embodiment of a combined heat and power plant according to the invention.

DETAILED DESCRIPTION

A combined heat and power plant 10 simultaneously makes available electrical energy for electrical consumer units 12 and thermal energy for thermal consumer units 14 and therefore has a particularly high degree of efficiency. However, problems can also arise from the fact that the electrical and thermal output of the combined heat and power plant 10 cannot be adjusted independently of each other. For example, if a high electrical output is requested from the combined heat and power plant 10 by the electrical consumer units 12 or via a connected power network 16,

whilst the thermal consumer units 14 require no or only a very low output, then problems can occur with the removal of the quantity of heat generated by the combined heat and power plant 10.

Some of the excess heat thus generated can be stored temporarily in stores 18 but if these are overloaded, the combined heat and power plant 10 must be switched off to prevent overheating. In particular when the combined heat and power plant 10 is integrated into a power network 16 with a high number of stochastic generators such as, for example, solar energy or wind power plants, there is however an urgent need for load balancing in the power network 16. In the case of a combined heat and power plant 10, additional back-up capacity would then have to be brought onstream, which is not economically advisable.

In order to avoid this, a heat exchanger 20 is coupled to the heat distribution network 22 of the combined heat and power plant 10. If the demand for electricity significantly exceeds the demand for heat, then excess generated heat can be dissipated via the heat exchanger 20. The heat exchanger 20 can thus be coupled, for example, to the surrounding air, to stationary or running water, and to the soil. Opening the cooling water circuit of the combined heat and power plant 10 so that cold fresh water is heated and then disposed of can also contribute to the removal of excess heat.

The requested quantity of heat can be further managed by controlling the thermal consumer unit 14. In the event of demand for electricity significantly exceeding the demand for heat, here too additional cooling of the combined heat and power plant 10 can be achieved. A building management system can, for example, slightly increase the room temperature of rooms which are heated by means of the thermal consumer units 14 in order to ensure additional heat removal. Any heated

swimming pools or the like can also be additionally heated up in order to contribute to the removal of heat.

If the excess heat is generated at night, a nighttime lowered temperature program of the room heating system can be suspended so that the rooms are again heated more intensely and additional heat is also thus removed. Such an energy management system is also possible outside residential premises, for example in commercial operations. Procedures with a high demand for thermal energy, such as heating processes, cleaning processes or the like can, for example, be conducted ahead of schedule so that the excess heat generated is removed.

As a whole, it is thus possible to prevent the combined heat and power plant 10 from having to be shut down because of overheating, which avoids the need to make available additional back-up capacities in the power network 16 and thus enables economic operation of mixed, small-scale and flexible power networks with a high number of stochastically operating generators.

54106-1600

CLAIMS:

1. A method for operating a combined heat and power plant for providing electrical and thermal energy for at least one consumer unit, comprising:

increasing requested heat output when a threshold value for a difference between provided heat output and the requested heat output is exceeded,

wherein the requested heat output is increased by dissipating a proportion of the heat output provided wherein the dissipation is effected by means of a heat exchanger coupled to surrounding soil.

2. The method as claimed in claim 1, wherein the heat exchanger is further coupled to the surrounding air and/or to a water reservoir.

3. The method as claimed in claim 2, wherein the requested quantity of heat is increased by increasing the heat consumption of the at least one consumer unit.

4. The method as claimed in claim 3, wherein a set heating temperature for a room or a swimming pool is increased in order to increase the heat consumption.

5. The method as claimed in claim 4, wherein lowering of the nighttime temperature of a heating system is suspended in order to increase the heat consumption.

6. The method as claimed in claim 5, wherein a further consumer unit is activated in order to increase the heat consumption.

54106-1600

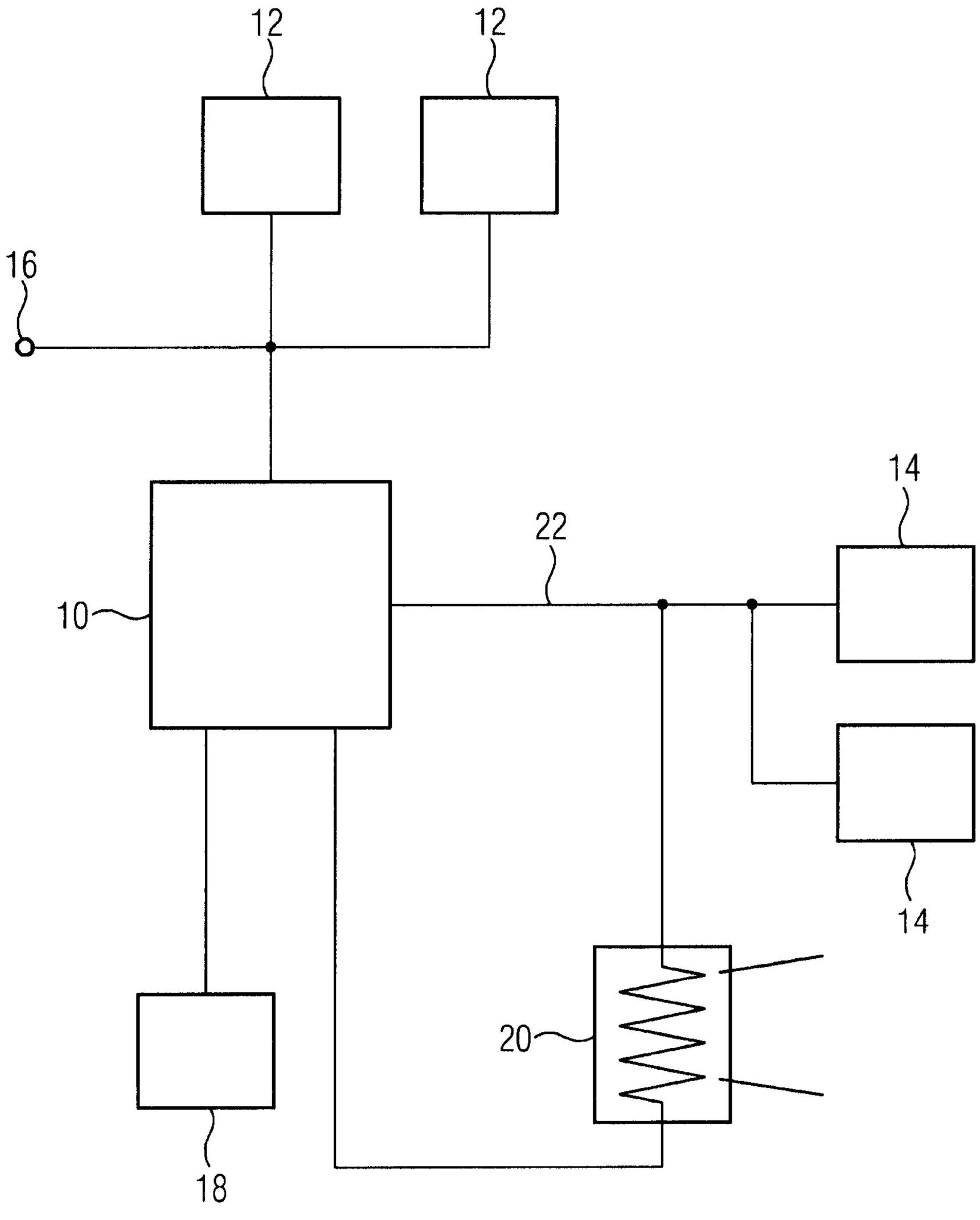
7. A combined heat and power plant, located in an environment, for providing electrical and thermal energy for at least one consumer unit via a heat distribution network, comprising:

a heat source;

a first heat exchanger by which heat is transferred from the heat source to the heat distribution network; and

at least one additional heat exchanger by which heat is discharged to the environment when a threshold for a difference between a provided heat output and a requested heat output is exceeded wherein the at least one additional heat exchanger exchanges heat with surrounding soil.

8. The combined heat and power plant as claimed in claim 7, wherein the at least one additional heat exchanger further exchanges heat with at least one of surrounding air and a water reservoir.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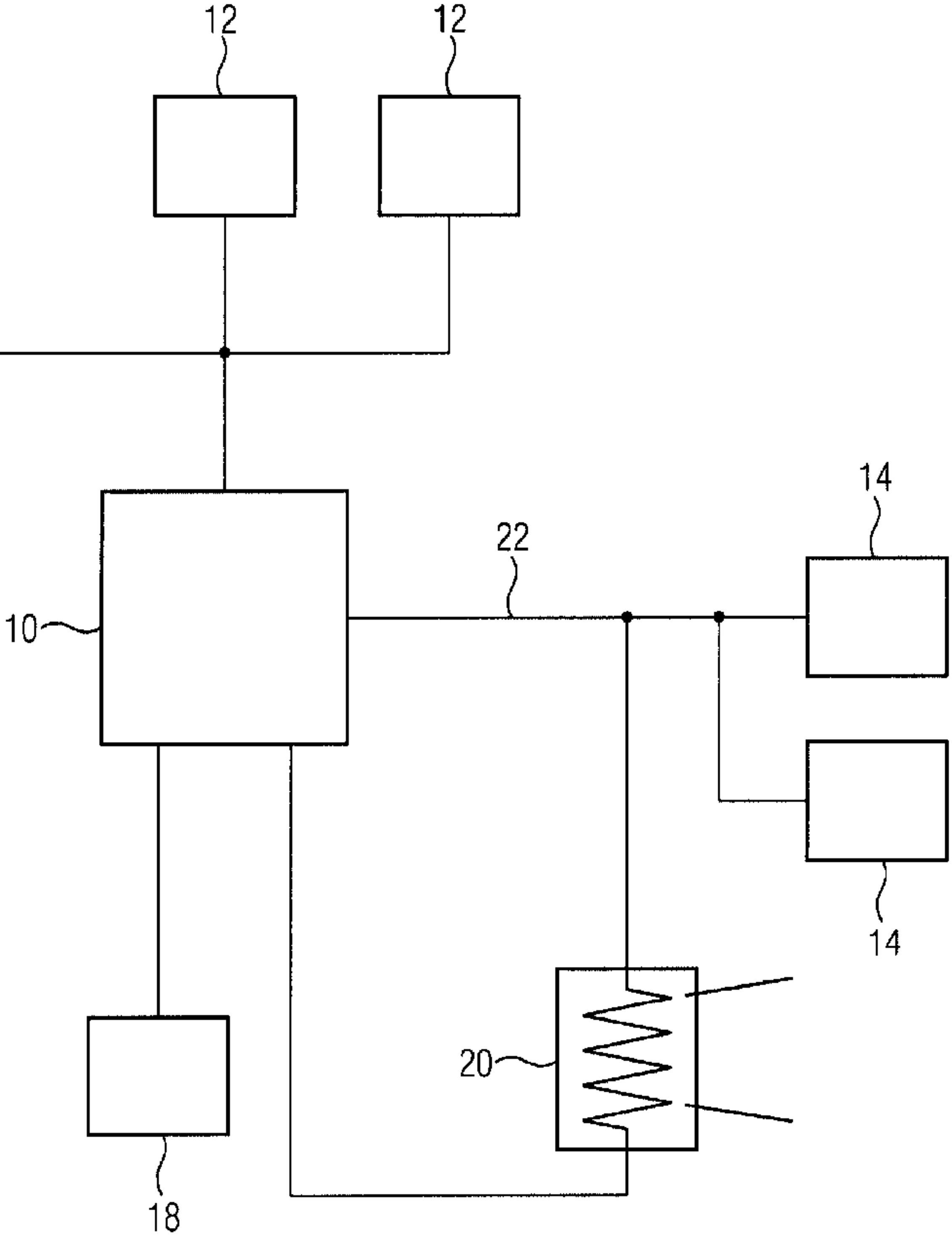
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