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(54) Device and method for regulation of electricity consumption diagram by heat pump

(57) Device and method for regulation of electricity consumption diagram by heat pump includes the module of covenanted electricity consumption diagram with instantaneous power consumption measurers. These are attached to central electrometer which is connected to control regulation module connected to control unit of heat pump or other electrically powered device. The heat pump installed in boiler-room or heat station is connected also to sensing and decoding unit of heating system coupled with electricity energy import sensing unit of heating system to control regulation module. In the summer, there is cold water period inputted into heat and hot water distribution in balancing group connected to heat pump and the water-water exchanger is connected to all closed and open heat and hot water take-off circuits and heat pump.

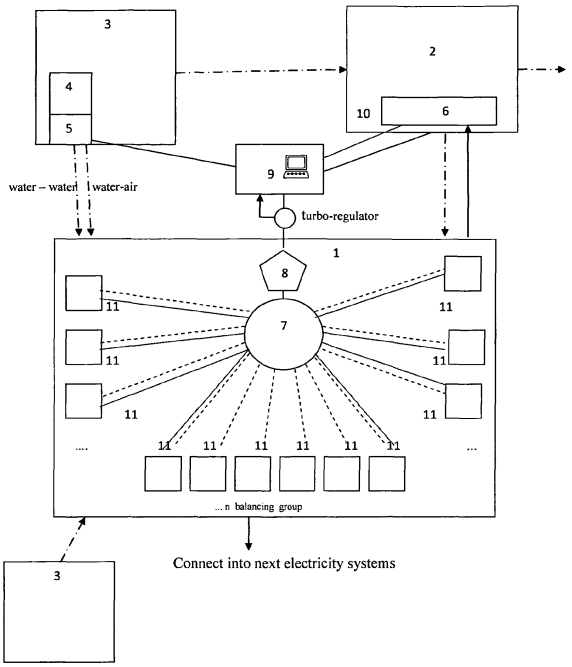


FIG. 1

EP 2 385 317 A2

Description

[0001] The present invention relates to a device and method for regulation of electricity consumption diagram in balancing group by heat pump useful for estates, urban zones and residential houses and for using standing charge of electricity.

[0002] The electricity compared with other products has one particularity, because it is not storable. There have to be equal the consumption amount of electricity and produced amount of electricity that is why the mains run on stable. An apartment sector has second highest final power consumption. Heating, hot water heating and lighting create main part in this sector. Power consumption depends mainly on heat and hot water consumption in households and power consumption of electric appliances and lighting. Approximately 80% of total power consumption is heat consumption which depends mainly on climatic conditions and this variation can be 10% a year. Absolute amount of power consumption depends largely on heat-technical building characteristics, effectuality of rating system and aeration, their regular maintenance and control but also dweller's behaviour.

[0003] The power supply present electricity sales to consumer from choices supplier. This field of supply is not regulated and it is going on supply and demand principle. The prices of power supply rest on business affairs and determine individually. In many electric systems, some or all consumers pay a fixed price per unit of electricity. The consumer paid ordered amount of electricity regardless real off-take at buying of electricity. So as not to go over or under taking of ordered amount of electricity it is necessary to monitor and keep to electricity consumption diagram. In the case of the consumption diagram breach to result the deviation of subject of settlement ie. the difference between the agreed quantity of electricity of Subject's balancing group and actual quantity of electricity of Subject's balancing group. Deviation biller's activity aimed to evaluate the deviation and consecutive settlement of individual market participants, which have signed the agreement on settlement of deviation with the deviation biller (so called Subjects of Settlement). Deviation biller registers the subjects of settlement and next-to mentioned activity is necessary in the qualities preservation and supply reliability priority to flexible respond on the deviation origination. It means immediately to ensure additional forces (contract amount excess) or to reduce production of some producers (no off-take).The deviation biller buys these supporting services and for that the additional expenses rise and they are project onto costumers according the ratio in which by breach of self consumption diagram to helped to deviation origination. The price of regulated electricity (using standing charge of electricity) by which are the deviations funded is much higher than price of electricity.

[0004] The active regulation of mains is possible only on the side of electricity power making and the field of regulation of mains is very difficult process because of large-scale regulation system. Electricity consumers largely have the flexibility in the time when they use the electricity and they can cut their costs. Nowadays there are limited attempts to shut-down of operation part in peak hours of power take-off time for example by regulation system ¼ hour maximum HMP 64, which ensures electricity supply measurement, consumption regulation by choices appliances switch-off and also measuring data archiving and PC visualization. Also regulation by city night lighting, but it is useful only at night.

[0005] In settings when energy savings during certain periods are desired, meters may measure demand, the maximum use of power in some interval. In some areas, the electric rates are higher during certain times of day, to encourage reduction in use. Also, in some areas meters have relays to turn offnonessential equipment.

[0006] Disadvantage of technical solutions for producing, distribution and supplying of heat and hot water for example for apartment sector and residential premises consist in that their present management systems and systems of supply of heat and hot water do not allow regulation of electricity consumption by switching off and switching on a heat pump as necessary. Also they do not allow any regulation of electricity consumption, amount and energy input of electricity in arranged heat or hot water circuit dropouts according as unplanned changes, accidents et al.

[0007] The heat pumps are used only for preparing hot water and heating the houses or residential premises till now. Their return on investment is protected only by high efficiency moreover only if the support price of electricity is applied.

[0008] It is an object of embodiments of the invention to provide an improved device for regulation of electricity consumption diagram by heat pump and an improved method of operating such a system. Device and method for regulation of electricity consumption diagram by heat pump placed into constructing distribution of heat and hot water generation and transmission for apartments of housing estates or residential premises connected to heat source of heat system and to all heat gains of heating system and to all closed heat take-off circuits. The regulation on the side of electricity power consumption is considerably fast and more continuous. It allows regulation of ¼ hour consumption diagrams.

[0009] Device and method for regulation of electricity consumption diagram by heat pump placed into constructing distribution of heat and hot water generation and transmission for apartments of housing estates or residential premises connected to heat source of heat system and to all heat gains of heating system and to all closed heat take-off circuits follow with the advantages of connection of consumers with diagrams directed "against each other". Device and method for regulation of electricity consumption diagram by heat pump includes the module of covenanted electricity diagram with instantaneous power consumption measurers, which are attached to central electrometer and connected to control

regulation module. This module is connected to control unit of heat pump or other electrically powered device. The heat pump or other electrically powered device is installed for example in boiler-room, heat station connected also to sensing and decoding unit of heating system which is coupled with electricity energy import sensing unit of heating system to control regulation module. Another function of device and method for regulation of electricity consumption diagram by heat is that in the summer, there is cold water period inputted into heat and hot water distribution in balancing group connected to heat pump of heating system and the water-water exchanger is connected to all closed and open heat and hot water take-off circuits and heat pump or control unit.

[0010] The heat pump or block of heat pumps can be distance controlled on the base of results of intermediate consumption and covenanted consumption diagram of balancing group and the regulation is workable in the range 0-100% of electricity input of heat pump. The heat pumps make use of water-air are proposed for continuous running and a actual device for hot water production providing 100% standby equipment.

[0011] In the summer period, there is the heat pump attached to the water-water exchanger into heat system and the cold water is supplied into heat units in the housing estates or residential premises by the change of temperature schedule.

[0012] The regulation is provided by the managed switching off, switching on and switching over the number of heat pumps which is connected into consumption of balancing group and such is used for hot water production. There is needed maximum heat input of heat pumps for that the continuous duty of hot water production be possible. When the heat pumps are switched off the supply of heat water into heat system secures initial device for production of hot water. The heat pumps connected into regulation within balancing group allowed regulation from 0 - 100% of electricity input of heat pumps. The advantage of present invention is that the system utilizes except intermediate consumption of hot water, the heat accumulation of whole hot water system too. The heat pumps or other electrically powered devices integrated to solution according to the invention have to perform some of specifications. They have to be located in balancing group, have to have continuous measurement of electricity power take-off and are remote controlled according to regulation demand. Other specification is that their heat output can allow their switching on and switching off according to regulation demand during a year. That means the year round operation for example 8700 hours a year but the device can be switched off for all year. Total current input of the heat pumps has to be so big to allow regulation. There is needed amount of 15 - 30 MW of current input for a trader and current input for one heat pump is 100 kW or lesser.

[0013] The peak hour of power take-off is regulated by connecting of heat pump into constructing distribution of heat and hot water producing and supplying for apartment units in balancing group for habitation and housing estates and by using of distance, automatic or manual control regulation module.

[0014] The amount of electricity power consumption allows a dimension of heat source or the unit of more ecological heat sources for demanded output. The advantage of present invention is that the using of heat pumps except for heat production but for regulation of electricity consumption diagram units in balancing group of deviation biller or another electricity market participant too change the economy of running and also return of investment to whole device. The economic return of investment is secured not by support price of electricity but by the economic price which is the result of base of necessity to regulate in balancing group. So the necessity of expensive system services buying has in energetic dropped out. There is possible to reach absolutely balanced consumption in balancing group of deviation biller or another electricity market participant. The device and method for regulation of electricity consumption diagram by heat pump is possible to use for regulation in a balancing group but also for consumption of surplus electricity within trading in another balancing groups and producers.

[0015] Embodiments of the present invention with now be described, by way of example, with reference to the accompanying drawing in which:

Figure 1 shows a schematic illustration of an embodiment of a device and method for regulation of electricity consumption diagram by heat pump according to the present invention.

[0016] The device and method for regulation of electricity consumption diagram by heat pump in balancing group 1 for habitation and housing estates link to all heat gains of heating system 2 and to all closed heat take-off circuits. Device and method for regulation of electricity consumption diagram by heat pump 4 according to the invention includes a module of covenanted electricity consumption diagram 7 with instantaneous power consumption measurers 11 which are attached to central electrometer 8 of balancing group 1. The central electrometer 8 is connected to control regulation module 9 which is connected to control unit 5 of heat pump 4 or other electrically powered device. The heat pump 4 or other electrically powered device is installed for example in boiler-room, heat station 3 connected also to sensing and decoding unit 6 of heating system 2 which is coupled with electricity energy import sensing unit 10 of heating system 2 to control regulation module 9.

[0017] Another function of device and method for regulation of electricity consumption diagram by heat is that there is cold water in the summer period inputted into heat and hot water distribution in balancing group 1 connected to heat pump 4 of heating system 2 and the water-water exchanger is connected to all closed and open heat and hot water take-off circuits and heat pump 4 or control

unit 5.

DESCRIPTION OF THE REFERENCE NUMBERS

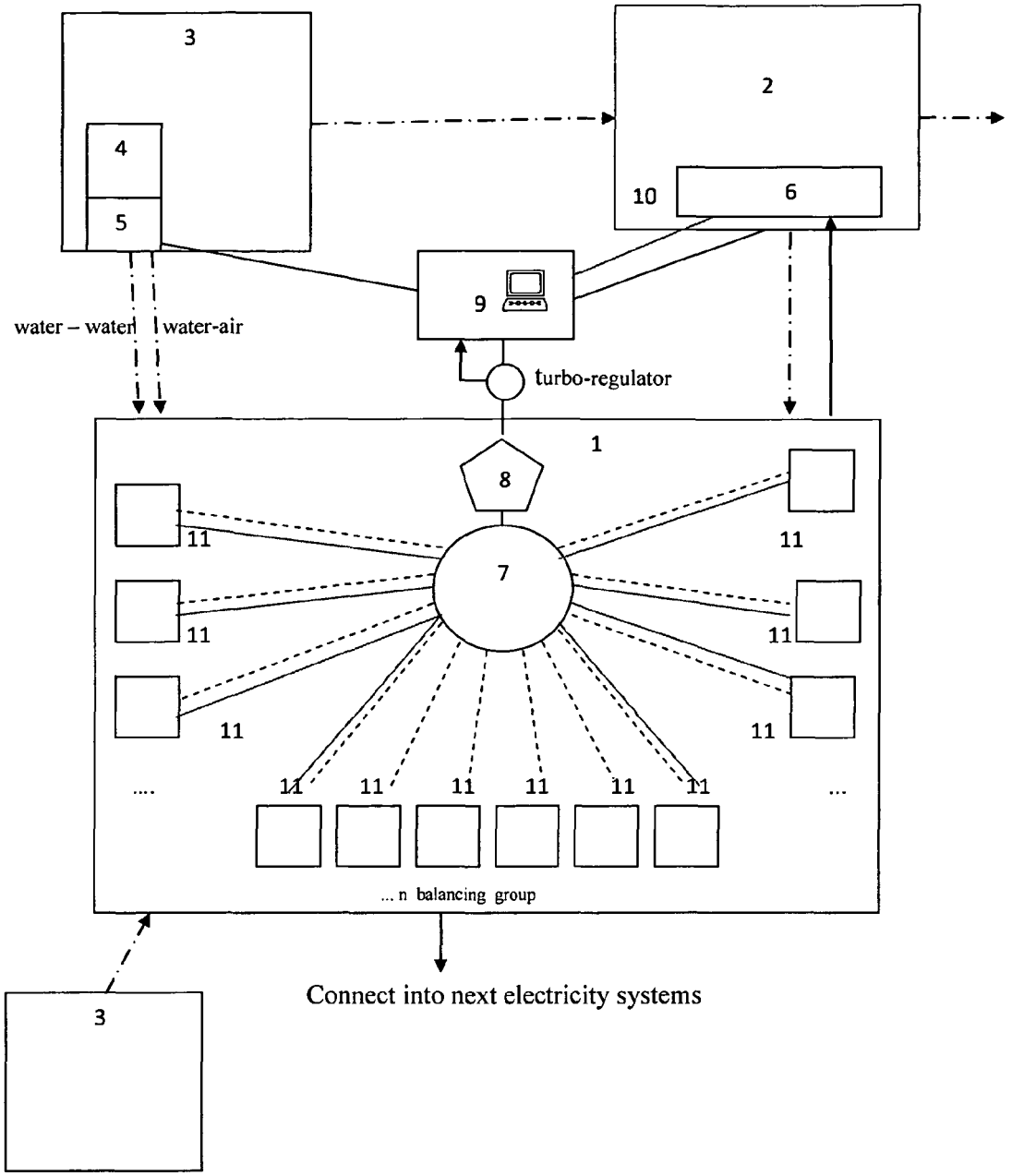
[0018]

1. Apartment units in balancing group
2. Heating system
3. Boiler-room, Heat station
4. Heat pump
5. Control unit
6. Sensing and decoding unit of rating system
7. Module of covenanted electricity consumption diagram
8. Central electrometer of balance unit
9. Control regulation module
10. Electricity energy import sensing unit
11. Instantaneous power consumption measurers

Claims

1. Device and method for regulation of electricity consumption diagram by heat pump installed in constructing distribution of heat and hot water producing and supplying for apartment units in balancing group (1) for habitation and housing estates link to all heat gains of heating system (2) and to all closed heat take-off circuits **characterized in that** includes the module of covenanted electricity consumption diagram (7) with instantaneous power consumption measurers (11) attached to central electrometer (8) of balancing group connected to control regulation module (9) which is connected to control unit (5) of heat pump (4) or other electrically powered device and is installed for example in boiler-room, heat station (3) connected also to sensing and decoding unit (6) of heating system (2) which is coupled with electricity energy import sensing unit (10) of heating system (2) to control regulation module (9).

2. Device and method for regulation of electricity consumption diagram by heat pump according to claim 1, **characterized in that** cold water is inputted into heat and hot water distribution in balancing group (1) connected to heat pump (4) of heating system (2) and the water-water exchanger is connected to all closed and open heat and hot water take-off circuits and heat pump (4) or control unit (5) in the summer period.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water – water
water-air
turbo-regulator
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... n balancing group
3
Connect into next electricity systems

FIG. 1