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(54) Title: THE COMBINED CONSTRUCTIONAL-ENERGETIC SYSTEM FOR BUILDINGS

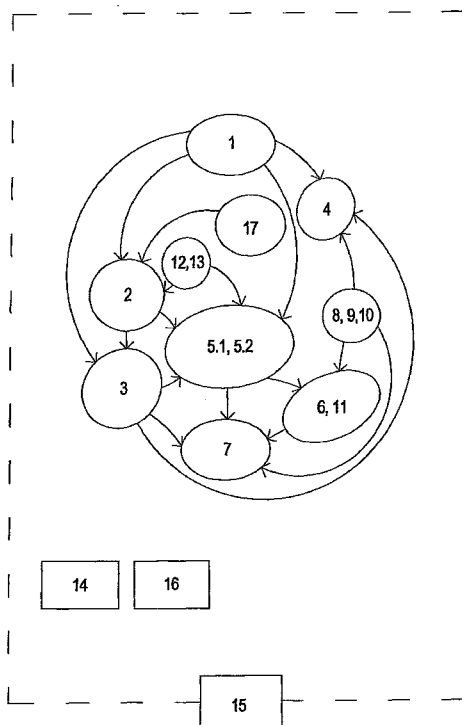


Fig 1

(57) Abstract: A complex creation of the internal environment of buildings with regard to the immediate or seasonal requirements shall be made by directed accumulation of heat from solar absorbers (1), which takes place in the two stages, where in the first phase, the heat accumulates to at least one short-term heat storage (2) based on liquid, solid substance or a change in condition and in the second phase, the heat accumulates to at least one long-term heat storage (3) heat-based on liquid or solid state change, while for phase resolution of heat accumulation is the criterion full heat capacity of short-term heat storage (2) which is achieved in the absence of solar energy by a top source (17) of heat. By active thermal protection built-in the packaging building structures that is provided by heat or cold distributed to thermal barrier wall (4) and at least by one of the three phases, where in the first phase heat distribution is implemented directly from solar absorbers (1); Heating which is provided by the heat distributed to low-temperature heating unit (6) and from at least one short-term heat reservoir (2) or from at least one long-term reservoir of heat or by mixing of substance from both heat reservoirs. Hot air heating or venting, receiving or donating of heat or cold in heat recovery ventilation unit (7), placed in a building with preheating or cooling the air in heat exchangers placed in.

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THE COMBINED CONSTRUCTIONAL-ENERGETIC SYSTEM FOR BUILDINGS

The area of technology

The invention deals with the combined constructional-energetic system of low-energetic and energetically passive buildings with an active thermal protection of the wrapping constructions and with the use of solar, environmental, waste and geothermal energy. The invention also deals with the particular device which ensures the operation of the combined constructional-energetic system of low-energetic buildings. The invention falls within the area of building industry and energetics.

Existing state of technology

The constructions of low-energetic and energetically passive buildings where the large-area low-temperature energetic systems of heating or cooling and large-area high-temperature systems of cooling are standardly used, for example systems in walls, floors and ceilings, are known in the present technique.

When considering the wall heating, the radiant flow of heat from the heated wall is used. This kind of heat is very comfortable and can be compared to warmth of sunrays, which warm us even during the winter months when the air temperature around us is very low. It is also very often combined with the floor or ceiling heating. Moreover, unlike inertial floor heating, wall heating is very flexible. Wall cooling brings new dimension of comfort during the hot summer days. It is very often combined with the floor or ceiling cooling. A dry type of construction wall cooling represents a quick solution for the prefabricated buildings, dry type of construction walls, attics etc. The system usually consists of plasterboards with embedded pipes. The hybrid energetic wall system using only one pipe system for heating during the heating season and for cooling during the cooling season is known as well.

Thermal-activated wall systems are also known. These are suitable for energetically passive houses where walls from concrete, ceramic or porous concrete shaped bricks are used. These systems use heat-activated material from the concrete constructions. It is a hybrid system which serves for heating during the heating season and for cooling during the summer. Pipe systems are either directly sealed into the concrete wall or placed in the parging if the wall is made from the concrete shaped bricks. This energetic system is characteristic for very low differences between the temperature on the surface of the wall and the temperature of the air in the interior. The exchange of heat or cold is achieved mainly by radiation; only small amounts of heat (cold) is spread by convection. Standard generators are used as the sources of heat or cold.

Wall energetic systems with an active thermal protection with one thermal barrier, as described for example in the Patent Specification SK 284 751, are known as well. It is a wall energetic system Isomax from Luxembourg, which similarly as thermal-activated wall systems uses heat-activated material. Unlike thermal-activated wall systems, it does not use only concrete core wall, but accumulated core wall from whatever material with high heat-accumulating properties can be used as well. This system uses heat gained from the sun radiation during its operation. This heat is stored in a heat accumulator and is used for active decreasing of thermal losses through the wrapping construction. Water from the soil pipe register is used for cooling during the summer. This system is applied exclusively to the external constructions. The pipe system is situated in the parging, which is constructed on the external surface of the walling. After it is already mature, a contact heating system is applied to the top. During the heating season, water comes into the pipe from the soil thermal reservoir; middle temperature of heating water ranging between 15 and 20 °C.

Among all the above mentioned constructional-energetic systems of buildings, the system described in the Patent Specification SK 284 751 represents a perspective idea for building low-cost energy saving buildings that use renewable resources of energy. On the other

hand, the following defects result from the process of operation which is not properly solved. The only source of heat is solar and geothermal energy. Solar energy is absorbed through the solar roof. This source causes unstable and non-sufficient absorption of solar radiation and can be used only during the summer and a partially transitional period only under the condition that the heat transfer material is sufficiently heated, i.e. the temperature is higher than the temperature in the long-term soil thermal reservoir. Geothermal energy is retained in the soil storage into the extent which is neglectable for the needs of heating. System Isomax retains these energies only for the direct use without the increase of energetic efficiency, for example by the means of heat pumps or solar collectors. With regard to a large number of unstable physical parameters which influence solar radiation abstraction, it is hard to state exactly the amount of energy. Retained energy is used only for charging-up of the long-term storage. The source is hard to be regulated and it is not able to cover abrupt requirements for the increase of power supply and it cannot cover the annual need of energy for heating and preparing of water as well. The design of the sources, as in the system Isomax, is done only empirically – i.e. by estimation. It is clear from the past realizations that the additional heat source is necessary.

Accumulation is realized only into the long-term soil reservoir, it is unstable and unequal. Most soil reservoirs are constructed with an open area at the bottom which causes non-controlled and immeasurable loss of accumulated heat. Efficiency of this reservoir is several times lower than that of a closed one, isolated thermal reservoir. The amount of stored energy and length of accumulation of the soil reservoir in a concrete capacity is hard to be calculated regarding a large amount of changing physical parameters such as soil moisture, its composition, the level of the ground water and its vertical movement and so on. Only that warmth of the heat transfer material is available to the heating which equals to the average temperature of the long-term soil thermal reservoir and the system cannot increase it. It is not possible to change the temperature of the heat transfer material by no other way than by

absorption of sun radiation. Calculation and suggestion are done by empirical estimation only.

Heat passing is done only to the thermal barrier and serves for a reduction of heat loss only. The temperature of the heat transfer material is limited by the temperature in the soil thermal reservoir or in the cooling circuit. It varies according to the actual temperature in the soil thermal reservoir and it cannot react to the abrupt changes of the weather or to the need of a change of the internal climate by higher or lower temperature than that which is to the disposition in the soil thermal reservoir. Regarding the fact that it is not possible to supply the thermal barrier with the heat transfer material which has a constant temperature throughout the whole year, the passage of heat through the building construction and its thermal resistance change. It is clear from the past realizations that such constructed thermal barrier cannot cover annual heat losses of the building.

The only source of cold is the soil cold reservoir situated above the frost depth. The temperature of the cooling material depends on the changing soil temperature; it is limited and cannot react to abrupt weather changes and to other needs by a cooler material that that which is available in the soil reservoirs.

The system deals with water pre-heating only, maximum temperature being 35 °C. The temperature of the venting air changes and depends on the temperature in the soil thermal reservoir and the soil cooling circuit and it is not possible to adjust it to the different temperatures that those in the soil reservoirs.

The solution to this problem has emerged. The result of this effort is further described
combined constructional-energetic system for buildings and device, according to invention.

The basis of the invention

The above mentioned defects are removed by combined constructional-energetic system for buildings and device according to

this invention. The basis of combined constructional-energetic system for buildings based on the exchange/change of energy according to the invention consist in the following. The complex creation of the internal environment of a building with regard to seasonal or abrupt requirements is realized by whatever combination of controlled heat absorption, heat production, cold production, heat accumulation, cooling, ventilation, heating, water pre-heating, use of water from warm waste water, use of waste heat from production and technological processes by the means of a controlled system of the building. This controlled system of the building actively modifies the temperature of the heat transfer material by the means of a top cool source and by the means of a short-term thermal reservoir and a short-term cold reservoir as it is further listed for particular modes.

Heat accumulation from the solar absorbers is realized in two phases. In the first phase, heat accumulates into at least one short-term thermal reservoir on the basis of fluid, solid substance or the substance with the ability to change its state. In the second phase, heat accumulates into at least one long-term thermal reservoir on the basis of fluid, solid substance or the substance with the ability to change its state. Full thermal capacity of a short-term thermal reservoir is a criterion for the distinction between the two phases of the heat accumulation.

Active thermal protection embedded in the wrapping constructions of a building is realized either by heat or by cold which is distributed into the thermal wall barrier in at least one of the three phases. In the first phase, the heat distribution is realized directly from the solar absorbers. In the second phase, the heat or cold distribution is realized from at least one long-term thermal or cold reservoir. In the third phase, the heat distribution is realized from at least one short-term thermal reservoir. Eventually, the heat or cold distribution into the thermal barrier can be realized by mixing in the mixing and regulating device.

Floor, wall or ceiling heating is realized by heat which is distributed into a low-temperature heating system from at least one short-term thermal reservoir, or from at least one long-term thermal

reservoir, or by mixing of the heat transfer material from both heat reservoirs.

Hot-air ventilation or heating is realized by accepting and/or passing of the recuperative cold in the recuperative air-technical unit which is situated in the building with air pre-heating or cooling in the heat exchangers situated above the frost level. Afterheating and aftercooling of venting air is done by the means of a heater or a cooler which is either situated near the recuperative air-technical unit or integrated directly into it.

The natural temperature of the soil above the frost level and/or the low temperature of fluid from the hydrotronic cold reservoir on the basis of fluid or solid material or the material capable of the change of its state or the solid material cooled by the top cold source is used for the distribution of cold for wall cooling and/or ceiling cooling and/or active thermal protection and/or controlled forced ventilation.

Warm water heating is realized in two phases. In the first, water preheating is realized either in the long-term thermal reservoir on the basis of fluid, solid material or the material capable of the change of its state and/or in the heat exchanger which serves for either cooling of the active thermal protection and/or in the coil cold of the recuperative air-technical unit. In the second phrase, water afterheatin is realized in the short-term thermal reservoir.

Heat from the top heat source and/or from recuperation and/or waste heat is also accumulated in the short-term thermal reservoir.

Energetic equipment of the building for whatever combination of controlled regime of heat absorption, energy production, energy transformation, heat accumulation, active thermal protection, heating, cooling, airing, water heating, water preheating is realized by equipments for measuring and regulation of constructional-energetic system of buildings. These are composed of at least one group of regulating and mixing devices and a programming regulator control and are characteristic for its components for the next modifications. It is possible to combine these modifications in accordance with immediate

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requirements of the operation, i.e. to connect and disconnect particular components of the whole device.

In modification of the thermal accumulator, it consists of a two-zone accumulating thermal branch. At least one solar absorber with at least one short-term thermal reservoir on the liquid basis or on the basis of a material capable of the change of its state, which is situated in above grade or underground compartment of the building, is connected in the first zone accumulating thermal branch. The short-term thermal reservoir is connected to the top heat source. At least one solar absorber with at least one long-term thermal reservoir on the liquid/solid basis or on the basis of a material capable of the change of its state, which is installed in the ground or in the central part of the building, is connected in the second zone accumulating thermal branch.

In modification of the active thermal protection, it consists of a three-zone branch. At least one active thermal protection body is directly connected to at least one solar absorber in the first zone branch. At least one active thermal protection body is ether directly or indirectly through the mixing device connected to at least one long-term thermal reservoir on the liquid/solid basis or on the basis of a material capable of the change of its state in the second zone. At least one active thermal protection unit is indirectly connected to at least one short-term thermal reservoir on the liquid basis or on the basis of a material capable of the change of its state, which is installed in above grade or underground compartment of the building through the mixing and regulating device, in the third zone. The short-term thermal reservoir is connected to the top thermal source.

In modification of the low-temperature heating system, it consists of a two-zone branch. At least one low-temperature heating body is indirectly connected through the regulating and mixing device to at least one long-term thermal reservoir on the liquid/solid basis or on the basis of a material capable of the change of its state in the first zone branch. At least one low-temperature heating device is indirectly connected through the regulating and mixing device to at least one short-term thermal reservoir either on the liquid basis or on the basis of

a material capable of the change of its state, which is the top thermal source, in the second zone branch.

In modification of a hot-air heating system, it consists of a three-zone branch. There is a recuperative air-technical unit, which is situated in a building with at least one hot-air heating unit, connected through the regulating and mixing device to at least one solar absorber in the first zone branch. There is a recuperative air-technical unit, which is situated in a building with at least one hot-air heating body, connected through the regulating and mixing device to at least one long-term thermal reservoir on the liquid/solid basis or on the basis of a material capable of the change of its state, in the second zone branch. There is a recuperative air-technical unit, which is situated in a building with at least one hot-air heating body, connected through the regulating and mixing device to at least one short-term thermal reservoir, which is the top thermal source, in the third zone branch.

In modification of cooling and/or venting system, there is at least one pipe circuit with agitate liquid situated above frost level which serves as the long-term cold reservoir. It is connected directly or indirectly through the regulating and mixing device to at least one active thermal protection unit which is installed in the wrapping construction of the building and/or to recuperative air-technical unit situated in the building. At least one cold source, such as the long-term cold reservoir on the liquid/solid basis or on the basis of a material capable of the change of its state and/or the top cold source with a short-term cold reservoir on the basis of fluid or on the basis of a material capable of the change of its state, is connected to the regulating and mixing device.

There are two phases in modification of the device which serves for water pre-heating and afterheating. In the first phase of water pre-heating, the regulating and fixing device of the warm water is connected to the long-term thermal reservoir, the heat exchanger from the cooling circuit of the active thermal protection and a cooler of the recuperative air-technical unit. In the second phase of afterheating, the regulating

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and mixing device of the warm water is connected to the short-term thermal reservoir, which is connected to the top thermal source.

There is at least one unit of the canalization system situated in the long-term thermal reservoir in the modification of the device which serves for re-gaining of heat from the waste heat. Heat from the heat exchanger for waste heat gained from technological processes, heat from cooling devices, production links, kitchens, laundries, drying plants etc., is supplied to the short-term thermal reservoir. The top thermal source is connected to the short-term thermal reservoir.

At least one device which is designated for the change of renewable energy resources into electrical energy, and which is connected to the accumulator of the electrical energy, is situated in the building for the purposes of the change of energy. It is possible to distribute electrical energy into all the above mentioned devices, if needed, from there. The controlling system of the building is a software-controlled regulator which is connected to all the above mentioned devices of different modifications and controls and optimizes their processes.

The advantages of the combined constructional-energetic system for buildings and device in accordance with the invention are clear from the effects, which are showed externally. Many systems partially use particular energetic devices, but none of them with such a creativity and so complexly as it is described here, in this patent. The further facts represent the crucial advantages and differences of the combined constructional-energetic system of buildings compared to the Patent System SK 284 751. In this invention, the source of heat is composed of at least two devices, i.e. basic and additional, here in the combined constructional-energetic system of buildings. The basic device is a year-long usable solar collector with much higher efficiency than the solar roof. The additional device is the top thermal source, such as gas boiler, heat pumping device, wood boiler, electro-boiler etc. By this solution, it is possible to permanently produce energy needed for heating and water preparation yearly. The choice, calculation, design and the heat source check are done on the basis of well-known

algorithms and technical calculations. This solution immediately reacts to the abrupt changes of the needed energy.

At least two devices are needed for the heat accumulation. Those are the main thermal reservoir as the short-term thermal reservoir and the additional thermal reservoir as the long-term thermal reservoir. The main thermal reservoir serves for immediate energy import and the additional thermal reservoir serves for the storing of overpower. Energy stored in the short-term reservoir immediately covers energy needed for heating, preparation of hot water. The temperature of the heat transfer material can be increased or decreased, in accordance with the momentaneous needs, on the same or different temperature as in the both reservoirs.

Heat passing is realized by multifunctional wrapping constructions of buildings with the functions of active thermal protection, heating and cooling. The temperature of the heat transfer material can be whenever modified on the temperature which is different from the temperature in the long-term thermal reservoir and in the cooling circuit. The device works with the constant temperature of the heat transfer material and thus secures a stable thermal resistance of the construction. Energy of the heat transfer material can be supplied to the active thermal protection either from solar collectors, long-term reservoir, short-term reservoir or by mixing of these thermal sources.

The cold source, besides the cooling circuit in the land, can be supplemented by an external short-term cold reservoir. This solution ensures enough cooling material with lower temperature than the temperature in the cooling circuit in the land and ensures an immediate reaction to the cold supply need.

Water pre-heating can be realized by the long-term reservoir and through the cooler of the recuperation of air-technical unit and heat exchanger serving for cooling by the means of active thermal protection in building constructions. Stable water heating is realized by the short-term thermal reservoir.

The required temperature of the venting air is modified in the heater, in other words in the heater of the internal air-technical unit.

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Heat passing is realized by recuperation and by mixing with the circulating air as well. The system can be extended by the transformation of solar energy into electrical energy.

Overview of the pictures from the drawings

The process of operation of the combined constructional-energetic system of buildings by the means of the invention is displayed in the drawings. There is a functional circuit layout of the combined constructional system on fig. 1. There is a functional circuit layout of the combined energetic system in the regime of heat accumulation on fig. 2. There is a functional circuit layout of the combined constructional-energetic system in the regime of the active thermal protection on fig. 3. There is a functional circuit layout of the combined constructional-energetic system in the regime of the low-thermal heating on fig. 4. There is a functional circuit layout of the combined constructional-energetic system in the regime of warm-air heating on fig. 5. There is a functional circuit layout of the combined constructional-energetic system in the regime of cooling and/or ventilation system on fig. 6. There is a functional circuit layout of the combined constructional-energetic system in the regime of water pre-heating and afterheating on fig. 7. There is a functional circuit layout of the combined constructional-energetic system in the regime of heat regaining from the waste heat on fig. 8. On fig. 9, there is a complex functional circuit layout of the combined constructional-energetic system, where all components for all fragmental regime modifications are included. On fig. 10, there is a complex functional economical circuit layout of the combined constructional-energetic system, where all necessary components of the device for all fragmental regime modifications are included. On fig. 11 and 12, there is a complex functional circuit layout of the combined constructional-energetic system, where all alternative solutions of the top thermal source, such as a heat pump and a fossil fuel boiler, are included.

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Examples of realizations of invention

It is taken into consideration that individual realizations of technological handling are presented for the illustration and not as restrictions of technological handlings. Experts acknowledged with the state of technology will find or will be able with the use no more than routine experiments to find a lot of equivalents to specific realizations of technological handling. Even such equivalents will fall within the scope of following requirements for protection. For the experts acknowledged with the state of technology it cannot be a problem to make optimal designs of construction, so these marks were not handled in detail.

Example 1

The process of operation of the combined constructional-energetic system of buildings on the basis of energy exchange or/and change in its full extend which is available during the winter season is described in this case of specific realization of the invention. The complex production of the internal environment of the building, with regard to the seasonal or abrupt requirements, is realized by whatever combination of the controlled regimes of absorption, accumulation, heat production, active thermal protection, low-temperature hot-air heating, venting, water heating and pre-heating, use of the waste heat, by the means of the controlling system of the building, which actively modifies the temperature of thermal transfer material by the means of the top thermal source and by the means of the short-term thermal reservoir, as displayed on fig. 1.

Heat accumulation from solar absorbers is realized in two phases-zones as displayed on fig. 2. In the first phase, heat is accumulated into at least one short-term thermal reservoir on the liquid/solid basis or on the basis of a material capable of the change of its state. In the second phase, heat is accumulated into at least one long-term thermal reservoir on the liquid/solid basis or on the basis of a material capable of the change of its state. Full thermal capacity of a short-term thermal

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reservoir is a criterion for the distinction between the two phases of the heat accumulation.

Active thermal protection, which is installed in the wrapping constructions of the building, is realized by heat which is distributed into thermal wall barrier in at least one of three phases-zones, as can be seen on fig. 3. In the first phase, the heat distribution is realized directly from the solar absorbers. In the second phase, the heat distribution is realized from at least one long-term thermal reservoir. In the third phase, the heat distribution is realized from at least one short-term thermal reservoir.

Floor, ceiling or wall heating is realized by heat which is distributed into the low-temperature heating system from at least one short-term thermal reservoir, or long-term thermal reservoir or by mixing of the thermal transfer material from both storages, as can be seen on fig. 4.

Hot-air heating or venting is realized by receiving and/or passing of recuperative heat in the recuperative air-technical unit, which is situated in the building with air pre-heating or pre-cooling in the heat exchangers. These are situated in the soil above frost level, as can be seen on fig. 5 and 6.

Heating of warm water is realized in two phases, as displayed on fig. 7. In the first phase, water pre-heating is realized in the long-term thermal reservoir on the liquid/solid basis or on the basis of a material capable of the change of its state. In the second phase, water afterheating is realized in the short-term thermal reservoir. Heat from the top heat source and/or from the recuperation is accumulated into the short-term thermal reservoir as well.

Example 2

The process of operation of the combined constructional-energetic system of buildings on the basis of energy exchange or/and change in its full extend which is available during the summer season is described in this case of specific realization of the invention. The complex production of the internal environment of the building, with

regard to the seasonal or abrupt requirements, is realized by whatever combination of the controlled regimes of absorption, accumulation, heat production, active thermal protection, low-temperature hot-air heating, venting, water heating and pre-heating, use of the waste heat, by the means of the controlling system of the building, which actively modifies the temperature of thermal transfer material by the means of the top heat source and by the means of the short-term thermal reservoir, as displayed on fig. 1.

Heat accumulation from solar absorbers is realized in two phases-zones as displayed on fig. 2. In the first phase, heat is accumulated into at least one short-term thermal reservoir on the liquid/solid basis or on the basis of a material capable of the change of its state. In the second phase, heat is accumulated into at least one long-term thermal reservoir on the liquid/solid basis or on the basis of a material capable of the change of its state. Full thermal capacity of the short-term thermal reservoir is a criterion for the distinction between the two phases of the heat accumulation.

Active thermal protection, which is installed in the wrapping constructions of the building, is realized by cold which is distributed into the active thermal protection-thermal wall barrier. Cold distribution is realized from at least one long-term cold reservoir.

Venting is realized by receiving and/or passing of recuperative cold in the recuperative air-technical unit, which is situated in the building with air-cooling in the heat exchangers. These are situated in the soil above frost level.

For the distribution of cold for the wall cooling and/or ceiling cooling and/or active thermal protection and/or controlled forced venting, the natural temperature of the soil above the frost level and/or low temperature of the fluid from the short-term cold reservoir on the liquid/solid basis or on the basis of a material capable of the change of its state is used. It is cooled by the top cold source, as can be seen on fig. 6.

Heating of warm water is realized in two phases, as displayed on fig. 7. In the first phase, water pre-heating is realized in the long-term

thermal reservoir on the liquid/solid basis or on the basis of a material capable of the change of its state and/or in the heat exchanger of the cooling circuit of the active thermal protection and/or in the cooler of recuperative air-technical unit. In the second phase, water afterheating is realized in the short-term thermal reservoir. Heat from the top heat source and/or from the recuperation is accumulated into the short-term thermal reservoir as well.

Example 3

The energetic equipment of the building which is actively usable in the winter season for whatever combination of the controlled regime of absorption, accumulation, heat production, energy exchange, active thermal protection, heating, venting or water heating and pre-heating is described in this case of specific realization of the invention. This is realized by the units or devices 17 for measuring and regulation of the constructional-energetic system of buildings which consist from at least one group of the regulating and mixing devices and the programming controlling regulator. It is characteristic for its components used for the next modifications, while it is possible to combine these modifications according to the immediate requirements of the process, i.e. it is possible to connect and disconnect particular components of the whole device, as can be seen on fig. 12.

In modification of the thermal accumulator, it consists of a two-zone accumulating thermal branch. At least one solar absorber 1 with at least one short-term thermal reservoir 2 on the liquid basis, alternatively on the basis of materials with the ability to change their states, which is installed in the overground, alternatively basement compartments of the building are connected in the first zone of the accumulating thermal branch. At least one solar absorber 1 with the long-term thermal reservoir 3 on the liquid basis, alternatively solid basis or on the basis of the material able to change its state installed in the soil or alternatively in the central part of the building are connected in the second zone of the accumulating thermal branch.

In modification of the active thermal protection, it consists of a three-zone branch. At least one unit of the wall thermal barrier 4 is directly connected with at least one solar absorber 1 in the first zone of the branch. At least one unit of the wall thermal barrier-wall thermal protection 4 is directly connected with at least one long-term thermal reservoir on the liquid basis, alternatively on the basis of a solid material or material with the ability to change its state, or it is connected indirectly through the mixing device 5.1 in the second zone branch. At least one thermal wall barrier unit 4 is connected to at least one short-term thermal reservoir 2 on the fluid basis, alternatively on the basis of the material able to change its state, which is installed in overground or alternatively in the underground compartments of the building through regulating and mixing device 5.1, in the third zone branch.

In modification of a hot-air heating system, it consists of a three-zone branch. There is a recuperative air-technical unit 7, which is situated in a building with at least one hot-air heating body, connected through the regulating and mixing device 5.1 to at least one solar absorber 1 in the first zone branch. There is a recuperative air-technical unit 7, which is situated in a building with at least one hot-air heating body, connected through the regulating and mixing device 5.1 to at least one long-term thermal reservoir 3 on the liquid/solid basis or on the basis of a material capable of the change of its state, in the second zone branch. There is a recuperative air-technical unit, which is situated in a building with at least one hot-air heating body, connected through the regulating and mixing device 5.1 to at least one short-term thermal reservoir 2, which is the top thermal source, in the third zone branch.

In modification of the venting system, there is at least one pipe circuit with a passing fluid which is situated above frost level - long-term cold reservoir 8, which is connected either directly or indirectly through the mixing and regulating device 5.1 to at least one thermal wall barrier unit 4 which is installed in the wrapping constructions of the

building and/or to the recuperative air-technical unit 7 which is situated in the building.

There are two phases in modification of the device used for the water pre-heating and afterheating. In the first phase – pre-heating – it is realized in the long-term thermal reservoir 3. In the second phase – afterheating – it is realized in the short-term thermal reservoir 2, which is connected to the top thermal source 17.

There is at least one unit 12 of the canalization system situated in the long-term thermal reservoir in the modification of the device which serves for re-gaining of heat from the waste heat. Heat from the heat exchanger 13 for waste heat gained from technological processes, heat from cooling devices, production links, kitchens, laundries, drying plants etc., is supplied to the short-term thermal reservoir 2.

Example 4

The energetic equipment of the building which is actively usable in the summer season for whatever combination of the controlled regime of absorption, accumulation, heat production, energy exchange, active thermal protection, heating, venting or water heating and pre-heating is described in this case of specific realization of the invention. This is realized by the units or devices for measuring and regulation of the constructional-energetic system of buildings which consist from at least one group of the regulating and mixing devices and the programming controlling regulator. It is characteristic for its components used for the next modifications, while it is possible to combine these modifications according to the immediate requirements of the process, i.e. it is possible to connect and disconnect particular components of the whole device.

In modification of the thermal accumulator, it consists of two-zone accumulating branch. In the first zone of accumulating branch, there is at least one solar absorber 1 connected to at least one short-term thermal reservoir on the fluid basis, alternatively on the basis of the material able to change its state, which is installed in overground or alternatively in the underground compartments of the building. In the

second zone of accumulating thermal branch, there is at least one solar absorber 1 connected to at least one long-term reservoir on the liquid basis, alternatively solid basis or on the basis of the material able to change its state installed in the soil or alternatively in the central part of the building.

In the modification of cooling and / or the ventilation system and / or active thermal protection is at least one tubular circuit with flowing liquid placed in a continuously variable depth of earth - long cold reservoir 8 connected directly or indirectly through the mixing device 5.1 with at least one body 4 of the active thermal protection - thermal barrier wall built in container building structures and / or regeneration air handling unit located in building 7. On mixing device 5.1 is connected at least one of the sources of cold such as long-term cold storage 8 on the basis of liquid or solid substance to a change in condition and / or top source 9 with a short-term cold storage 10 based on liquid cooling, alternative substances with a change in condition.

In the modification of equipment is pre-heating and water heating taken place in two phases. In the first stage of preheating is linked to a control device and mixing device 5.2 of hot water with long-term water storage 3 of heat, heat exchanger 11 cooling circuit of an active thermal protection and coolant recovery ventilation units. In the second stage of reheating, mixing and hot water control device 5.2 is linked with short-term heat storage, which is connected to the top heat source.

In the modification of equipment for heat recovery from waste heat is at least one body 12 of sewer system located in the long hot reservoir 3. Heat from heat exchanger 13 to capture waste heat from technological processes such as heat from the refrigeration equipment, of production lines, from kitchens, laundries, drying rooms and the like, is transferred to the short-term storage of heat and 2 after filling its capacity to long-term reservoir 3 of heat.

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Example 5

In this example of specific realisation of invention is shown power plant building actively usable in whatever period for any combination of controlled absorption system, heat storage, energy production, energy conversion, active thermal protection, cooling, venting, water heating, preheating water. The device is sufficiently described in Examples 1 to 4. Moreover, the combined construction and energy system of buildings can be completed with the device 14 to convert renewable energy for electricity placed on the building and connected to the battery accumulator 16 to cover the electricity consumption of electricity for all appliances in the building.

Fig. 10 shows in saving modification the energy-efficient building equipment, where is the solar absorber 1 solar roof without solar collectors and only with one top sources of heat 17 - electric heater.

Alternatively, to a short-term heat reservoir 2 based on heat liquids or substances with a change in condition is possible to join other top sources heat 17 such as fossil fuel boiler and heat pump as shown in Fig. 9 and 11 only or heat pump as shown in Fig. 12.

Also, in the various alternatives can be used solar absorber 1 as a solar collector and / or solar roof.

Utilization in the industry

Method of operating a combined construction and building energy system based on exchange and / or energy conversion and device according to of the invention finds utilization in the building industry.

PATENT CLAIMS

1. The combined constructional - energetic system based on exchange founds / or energy conversion, marked out by the fact that the complex formation of the internal environment of buildings with regard to the immediate or seasonal requirements are taken place by controlled absorption accumulation and / or the production of heat and / or cold, by controlled active thermal protection, and / or controlled low temperature or hot air heating and / or cooling and / or controlled ventilation and / or controlled heating and / or pre-heating water and / or use of waste heat building management systems, which actively adjusts the temperature of heat transfer substance with a top heat source and through short-term storage as follows:

- accumulation of heat from solar absorbers, which takes place in two stages, where in the first phase, heat accumulates in at least one short-term heat storage based on liquid or solid substance with a change of state and in the second phase the heat accumulates to at least one long-term heat storage based on liquid or solid state change, while for the phase resolution of heat accumulation the criterion is full of heat capacity of short-term storage of heat, which is achieved in the absence of solar energy by top source of heat;
- active thermal protection built in container building structures to be heat or cold distributed to active thermal protection - thermal barrier wall heat transfer through a substance in liquid or gaseous state and at least by one of the three phases, where in the first phase heat distribution is made directly from the solar absorber, in the second phase, the distribution of heating or cooling is carried out from at least one long-term storage of heat or cold, in the third phase, the heat distribution is carried out from at least one short heat storage;
- and / or heating, which takes place by heat distributed to low-temperature heating system and that of at least one short-term heat

storage, or from at least one long-term heat storage or heat transfer by mixing the substance of both storage;

- and / or hot air heating or ventilation of borrowing and / or transfer of regenerative or cold in the heat recovery air handling units located in the building with the pre-heating or pre-cooling of air in heat exchangers placed in the continuously variable soil depth.

2. Combined constructional- energetic system for buildings according to claim 1, marked out by the fact that for the distribution to the cold wall and / or ceiling cooling and / or active thermal protection and / or controlled forced ventilation uses the natural temperature of the soil from freezing depth-independent and / or low temperature, from short-term heat storage of liquid-based cooling fluids or substances with the change or state of a solid cooled by top cool reservoir.

3. Combined constructional - energetic system for buildings according to claims 1-2, marked out by the fact that complex formation of the internal environment of buildings with regard to the immediate or seasonal requirements, in addition to controlled accumulation and / or heat production and / or cold and controlled low temperature and / or hot-air heating or ventilation or cooling has also carried out by a controlled two-step heating water, where in the first phase is carried out preheating hot water tank in the long term heat storage_ on the basis of liquids, a solid substance or substances with change of state, and / or in a heat exchanger in the cooling circuit of an active thermal protection, and / or in the cooler heat recovery air-handling units, in the second phase by heating in a short reservoir .

4. Combined constructional - energetic system for buildings according to claims 1 to 3, marked out by the fact that into short-term heat storage term heat_ is still absorbed the heat from the top heat source and / or recovery of air-technical unit.

5. Power plant building device on the absorption and accumulation of term heat storage_ and / or managed the production and / or energy conversion and / or active thermal protection and / or heating and / or cooling and / or venting and / or heating and / or preheating water consisting of solar absorbers, top source, heat storage, exchangers and tanks, marked out by the fact that modification of the heat storage_ accumulator consists of a dual-zone heat storage_ accumulation branches, where in the first branch of heat storage_ accumulation zone is linked to at least one solar absorber (1) with at least with one short-term storage (2) of heat_ on the basis of liquid or substance with the change in condition installed in the overhead spaces or basements of buildings with the a top heat source (17), where in the second zone of heat storage accumulation zone is linked to at least one solar absorber (1) with long-term storage (3) of heat_ on the basis of liquid, a solid substance or substances with the change of state installed in the ground or in the central part of the building;

- and further in modification of active thermal protection consists of a three-zone branch where in the branch of the first zone is connected directly to at least one element of active thermal protection - thermal barrier wall (4) with at least with one solar absorber (1); and where in the branch of the second zone is connected directly to at least one element of active thermal protection - thermal barrier wall (4) with at least one long-term storage (3) of heat on the basis of liquid or a solid substance or substance with a change in condition and / or indirectly through mixing and regulatory device according to (5.1);

and where in the branch of the third zone is indirectly linked to at least one element of active thermal protection - thermal barrier wall (4) with at least one short-term storage (2) of heat storage on the basis of liquid or substance with the change in state installed in above ground or basement areas of buildings through mixing and regulatory device according to (5.1);

and further in modification of low temperature heating system consists of dual-zone in the branch_ where the first zone branch is linked indirectly through regulatory mixing and control device (5.1) to at least

one body (6) of low temperature heating with at least one long-term storage (3) of heat on the basis of liquid solid or substance or substance with the change state ; and where in the branch_of the second zone is linked indirectly through regulatory mixing and control device (5.1) with at least one body (6) of low temperature heating with at least one short-term storage (2) of heat on the basis of liquid or substance with a change in state ;

6. Power plant building device on the absorption and accumulation of heat storage and / or managed the production and / or energy conversion and / or active thermal protection and /or heating and / or cooling and /or venting and /or heating and / or preheating water consisting of solar absorbers, top source of heat storage, exchangers and reservoirs, marked out by the fact that in the modification of warm-air heating system consists of a three-zone branch, branch where the first zone is a heat recovery ventilation unit (7) located in a building with at least with one body connected via regulatory and mixing control device (5.1) with at least one solar absorber 1; in the line of the second zone is a heat recovery ventilation unit (7) located in a building with at least one body connected via regulatory and mixing control device (5.1) with at least one long-term storage (3) of heat-based liquid or solid substance to a change in condition; in the third zone branch is a heat recovery ventilation unit 7 placed in the building with at least one body of hot air connected with regulatory and mixing control device (5.1) with at least one short-term storage (2) of heat which is connected with top source of heat 17.

7. Energy equipment for building on the absorption and accumulation of heat and / or managed production and / or energy conversion and / or active thermal protection and / or heating and / or cooling and / or venting and / or heating and / or preheating water according to at least one of claims 5-6, marked out by the fact that in the modification of cooling and/or venting system is at least one tubular circuit with flowing fluid placed in continuously variable depth of soil as long-term

storage system (8) connected directly or indirectly through the regulatory mixing and control device (5.1) with at least one body of physically active thermal protection (4) built-in packaging designs of building and / or regeneration air handling unit (7) located in the building, while to the regulatory mixing and control device (5.1) is connected at least one of the sources of cold such as long-term reservoir (8) cold-based liquid or solid substance to a change in condition and / or top as an additional source of cold (9) with short-term cold reservoir (10) based on liquid or substance to a change in condition.

8. Energy equipment for buildings on the absorption and accumulation of heat and / or managed production and / or energy conversion and / or active thermal protection and / or heating and / or cooling and / or venting and / or heating and / or preheating water according to at least one of claims 6 and 7, marked out by the fact that the modification of the device for water heating and preheating is two-phase, where in the first stage of preheating is linked to mixing and hot water control device (5.2) with long-term storage of heat (3), the heat exchanger from the circuit (11) active cooling thermal insulation and air-cooler heat recovery technical unit; in the second stage of reheating is linked to mixing and hot water control device (5.2) with short-term heat storage (2), which is connected to the top heat source (17).

9. Energy equipment for buildings on the absorption and accumulation of heat and / or managed production and / or energy conversion and / or active thermal protection and / or heating and / or cooling and / or venting and / or heating and / or preheating water according to at least one of claims 6 and 8, marked out of the fact that in the modification of the equipment for the recovery of waste heat is at least one body (12) of sewer system located in the a long-term storage (3) heat, while the outputs with waste heat from equipment (13) of technological processes such as refrigeration equipment, production lines, kitchens, laundries, drying rooms are connected through a heat exchanger with a short-term

heat storage (2) and after filling its capacity of long-term heat storage, while top heat source (17) is linked to short-term heat storage (2).

10. Energy equipment for buildings on the absorption and accumulation of heat and / or managed production and / or energy conversion and / or active thermal protection and / or heating and / or cooling and / or venting and / or heating and / or preheating water according to at least one of claims 6 and 9, marked out by the fact that in the modification of the energy conversion is on a building located at least one device (14) for conversion of renewable energy for electricity, combined with the accumulator (16) of electricity.

11. Power equipment device for buildings on the absorption and accumulation of heat and / or managed the production and / or energy conversion and / or active thermal protection and / or heating and / or cooling and / or venting and / or heating and / or preheating the water according to at least one of claims 6 and 10, marked out of the fact that the solar absorber (1), short-term reservoir (2) of heat on the base of liquid or substance with change in state, long-term storage (3) of heat on the base of liquid or solid substance with change in state, physically active thermal protection body - thermal barrier wall (4), regulatory mixing and control device (5.1), hot water mixing device (5.2), body of (6) low-temperature heating, heat recovery ventilation unit (7), long-term cold reservoir (8), an additional source of cold (9), short-term cold reservoir (10) based on liquid or substances with change in state, circuit (11) of active cooling thermal protection, body of (12) drainage system, device (13) of technological processes, top heat source (14) are connected with the management system device (15) of the building.

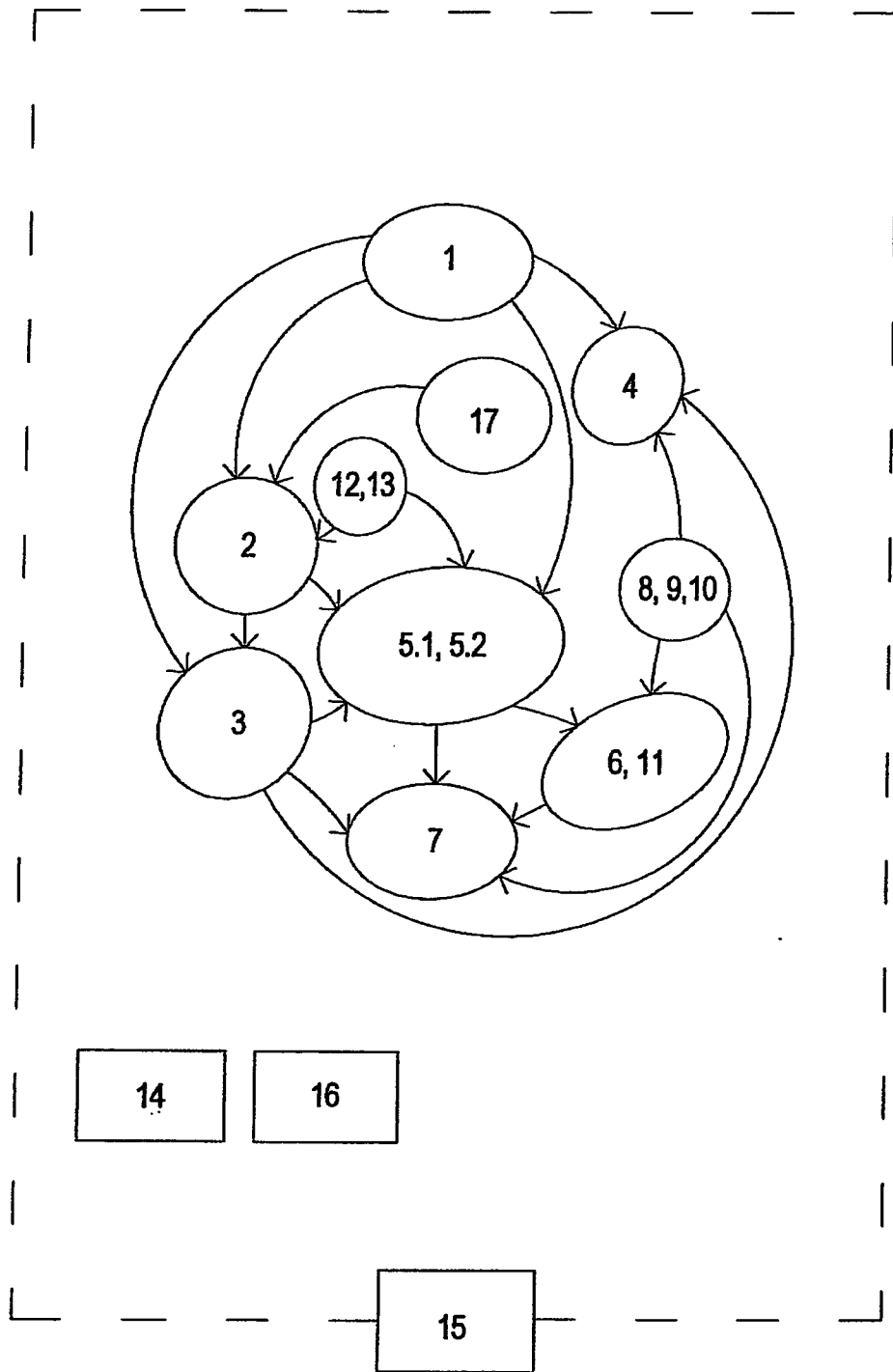


Fig 1

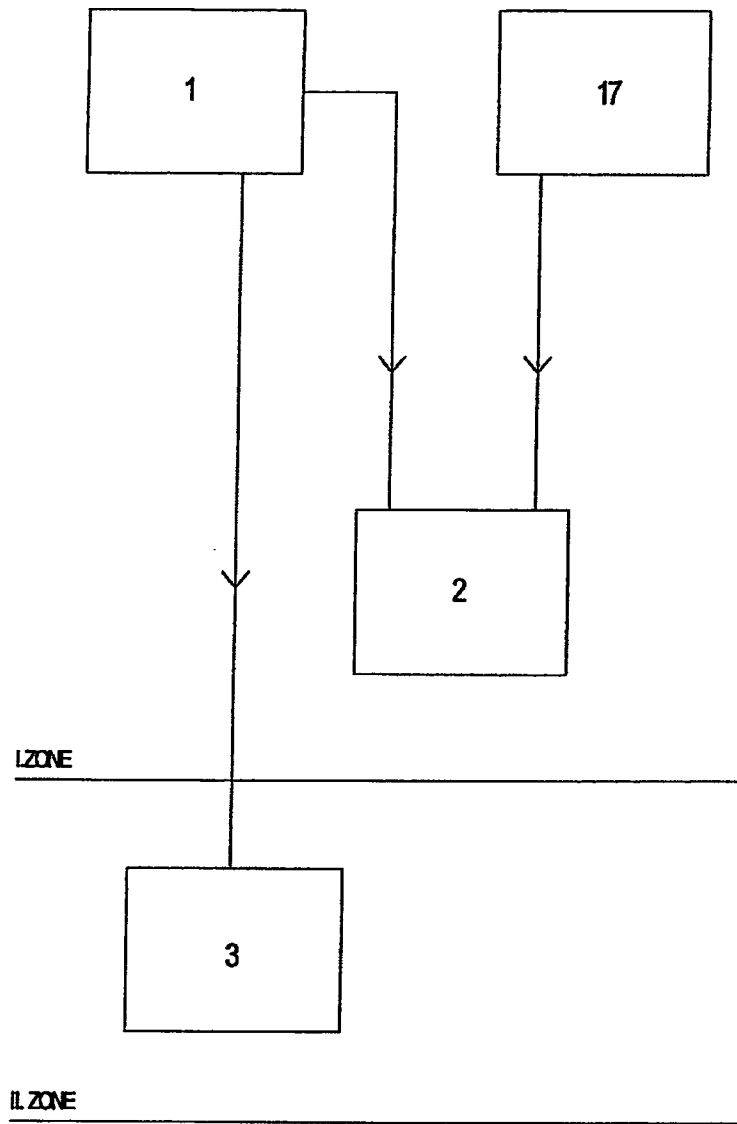


Fig 2

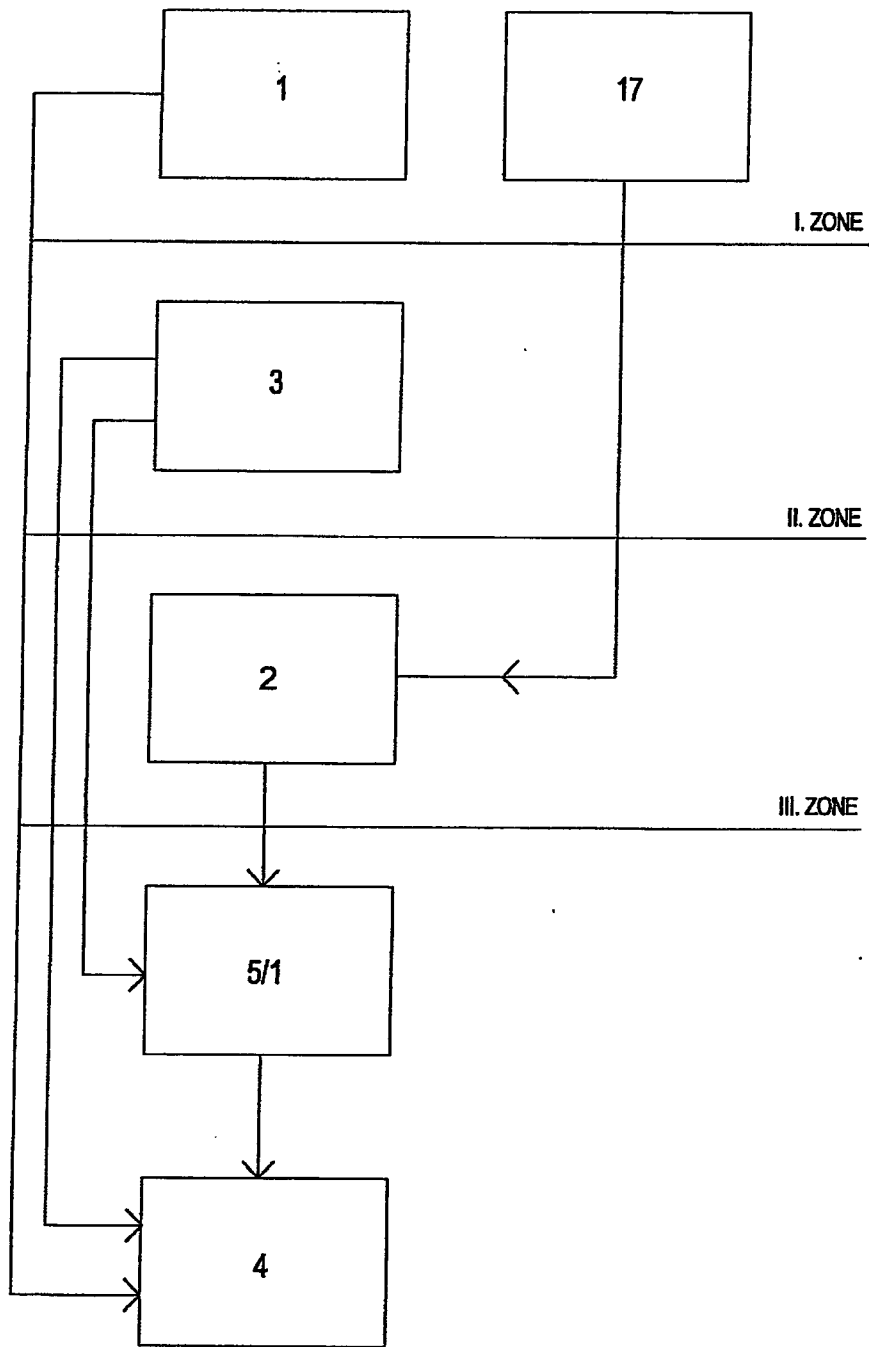


Fig 3

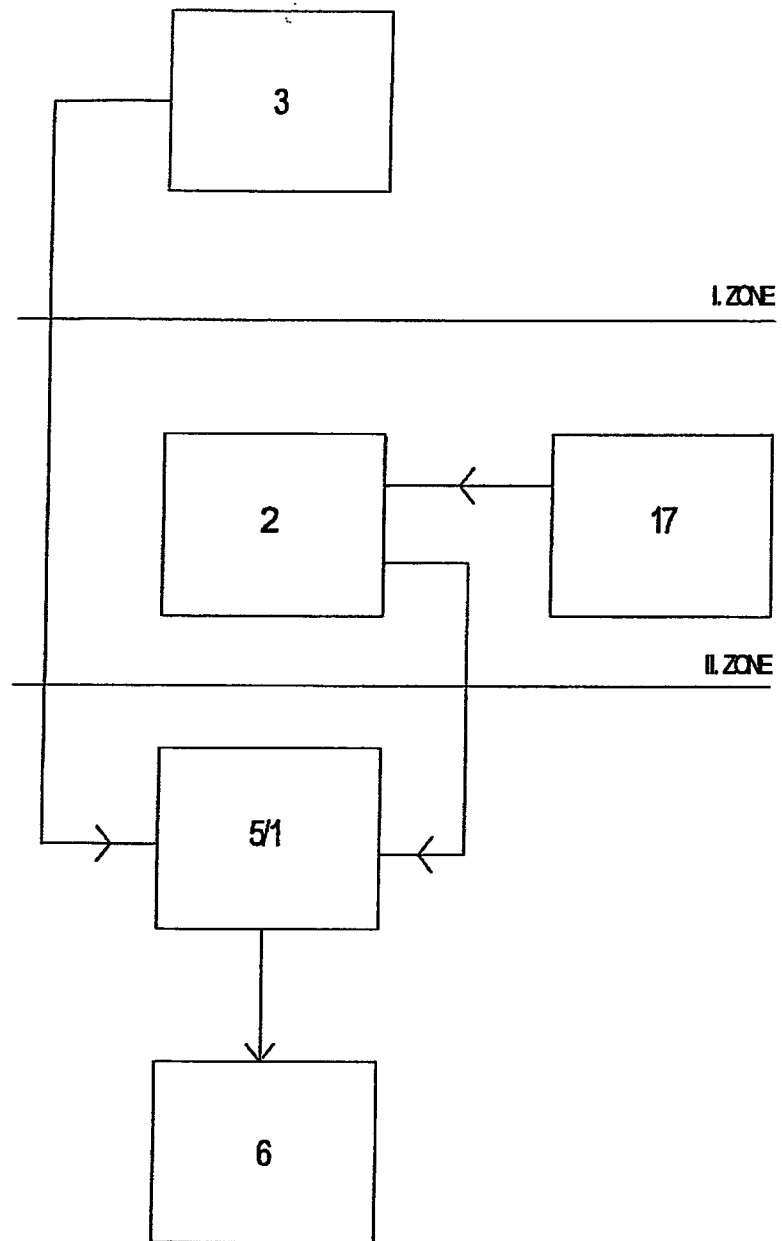


Fig 4

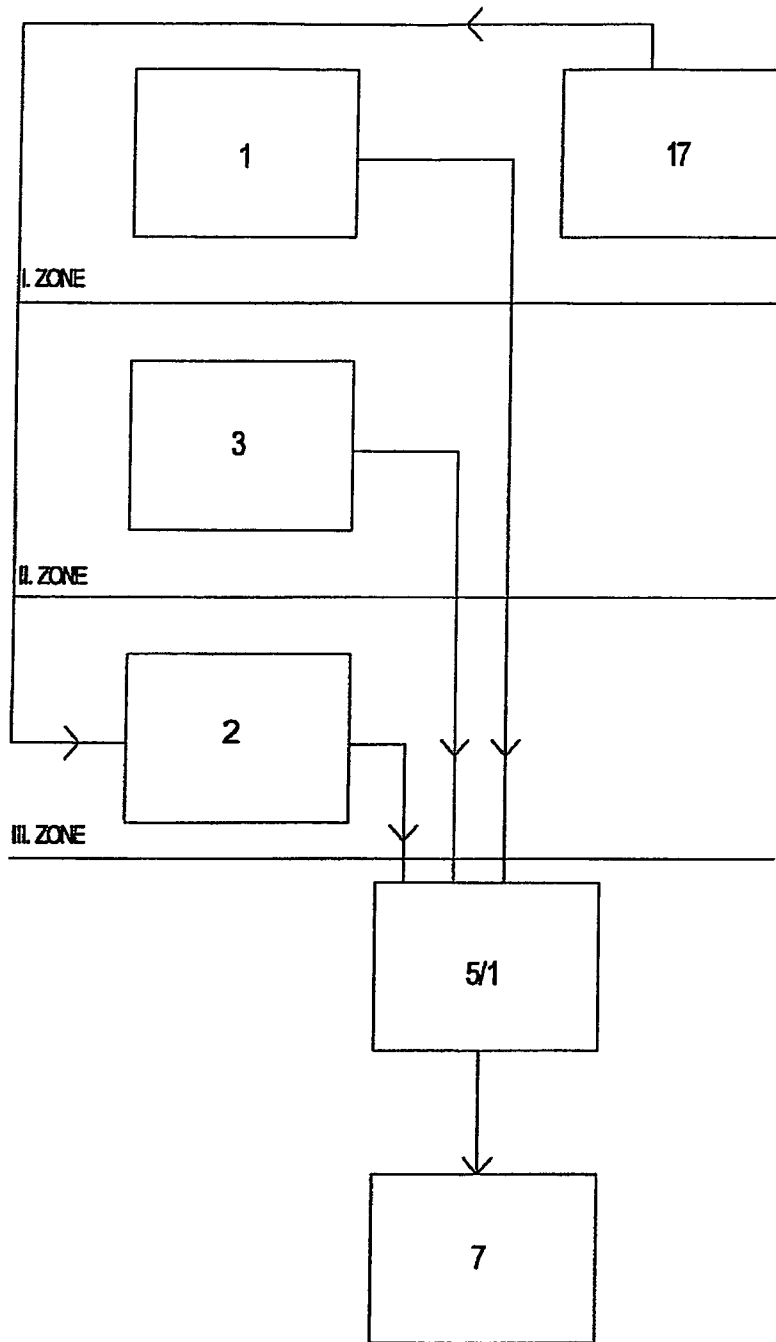


Fig 5

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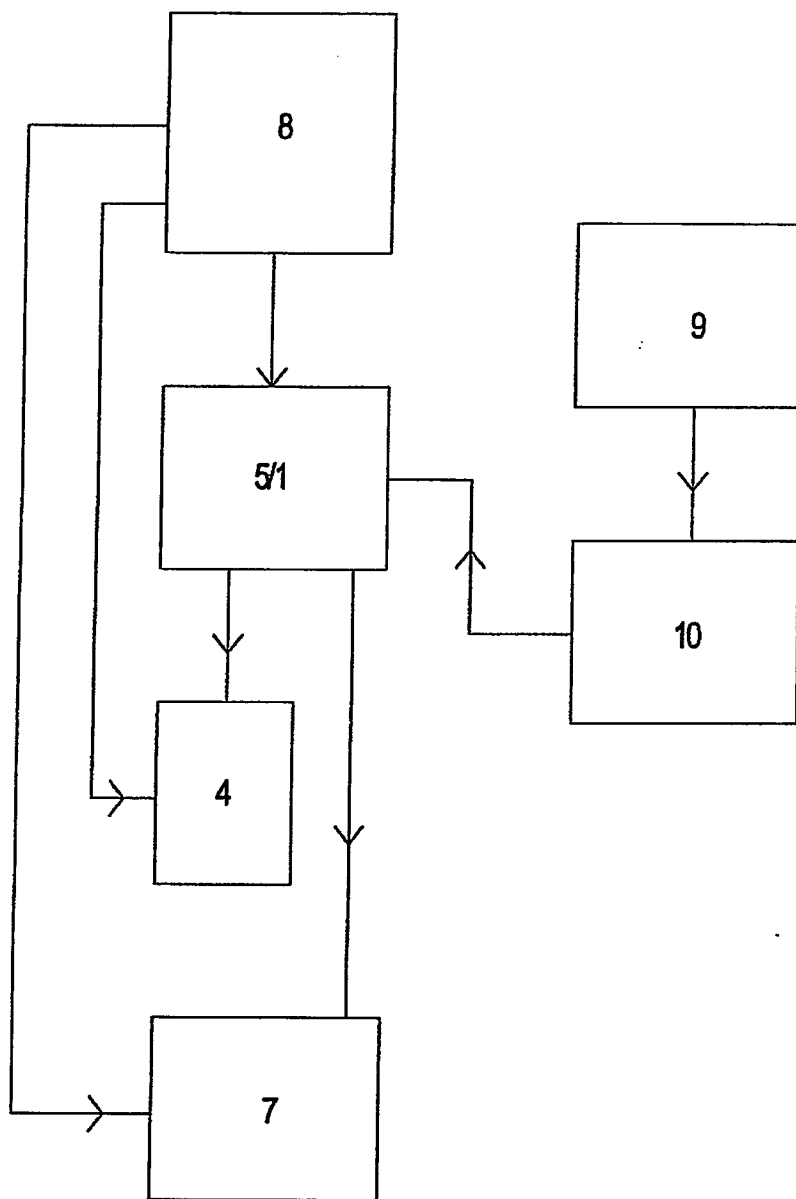


Fig 6

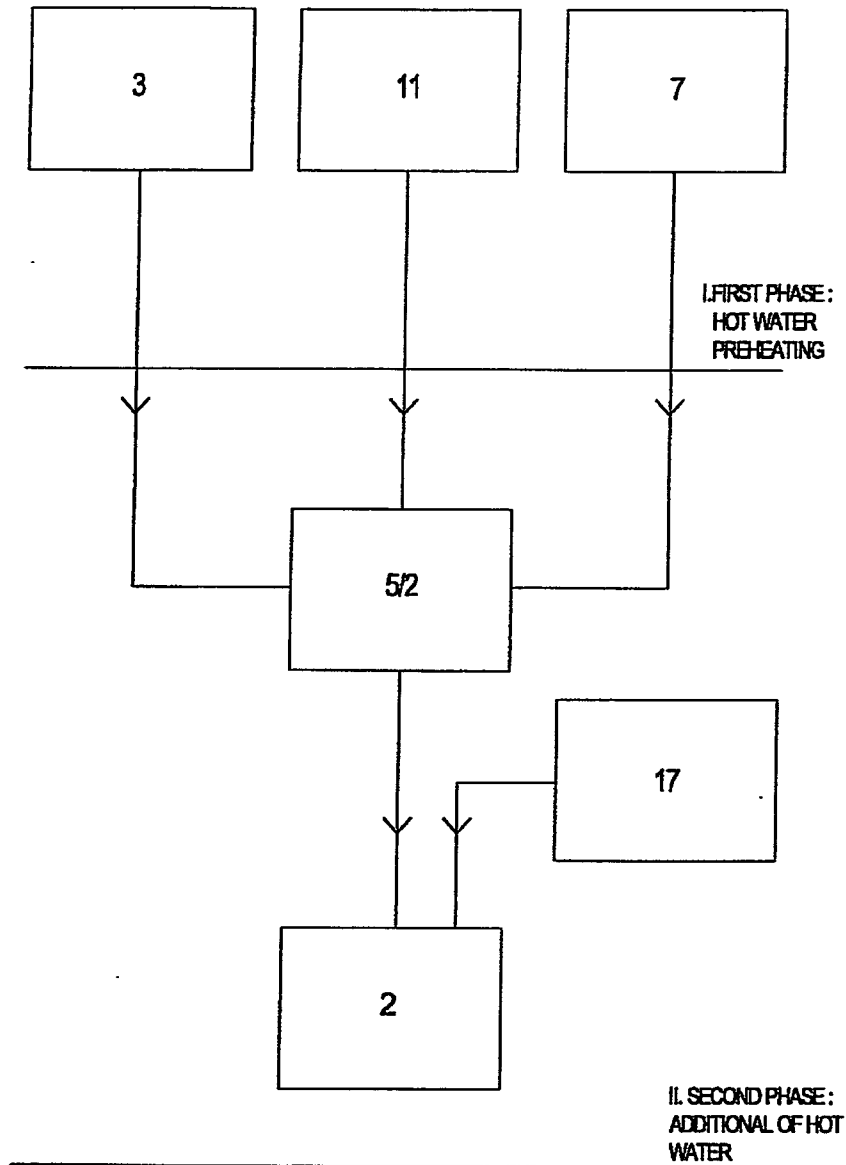


Fig 7

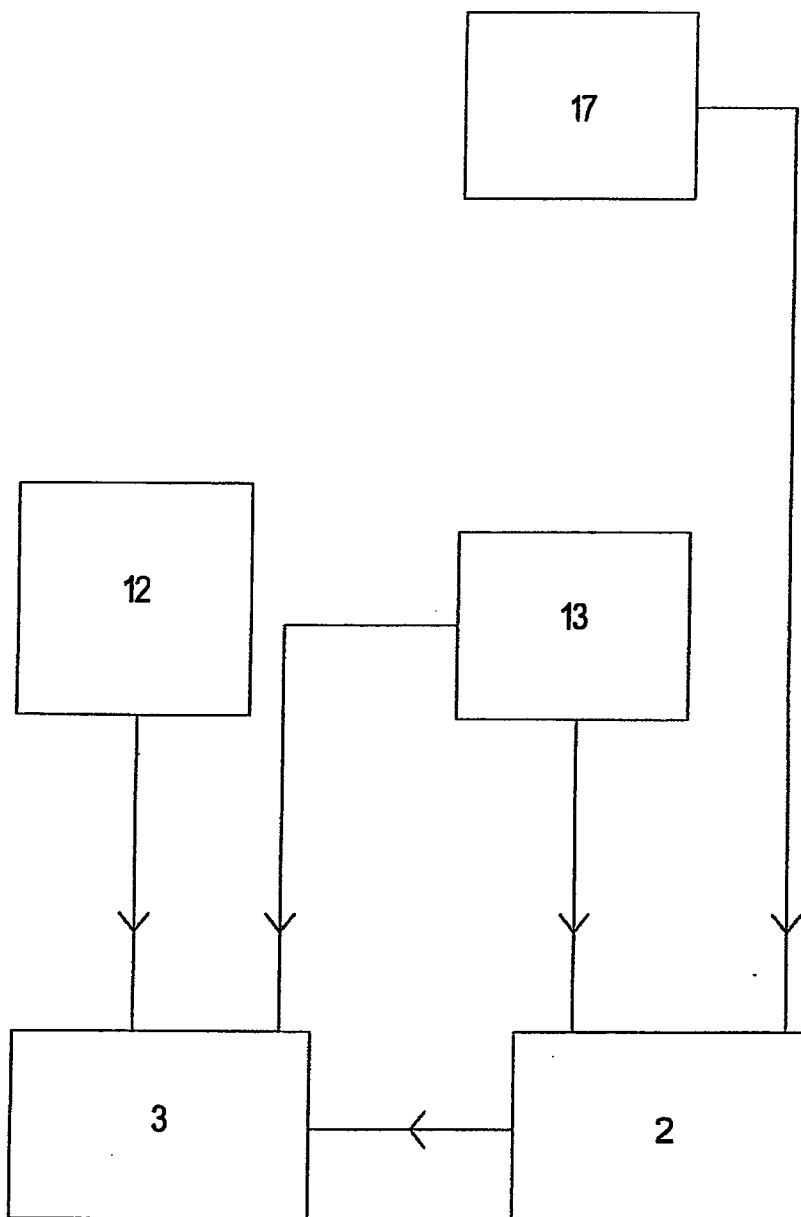


Fig 8

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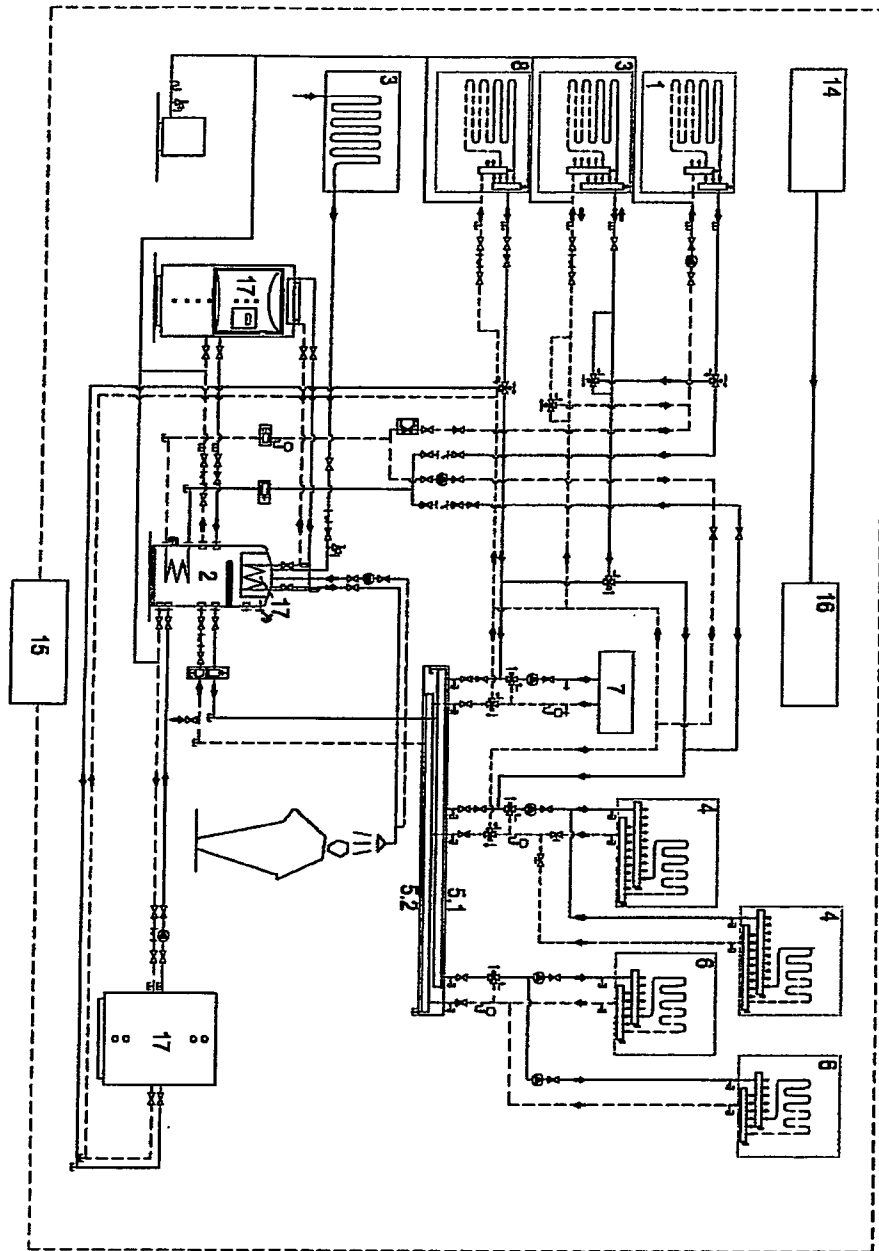


Fig 9

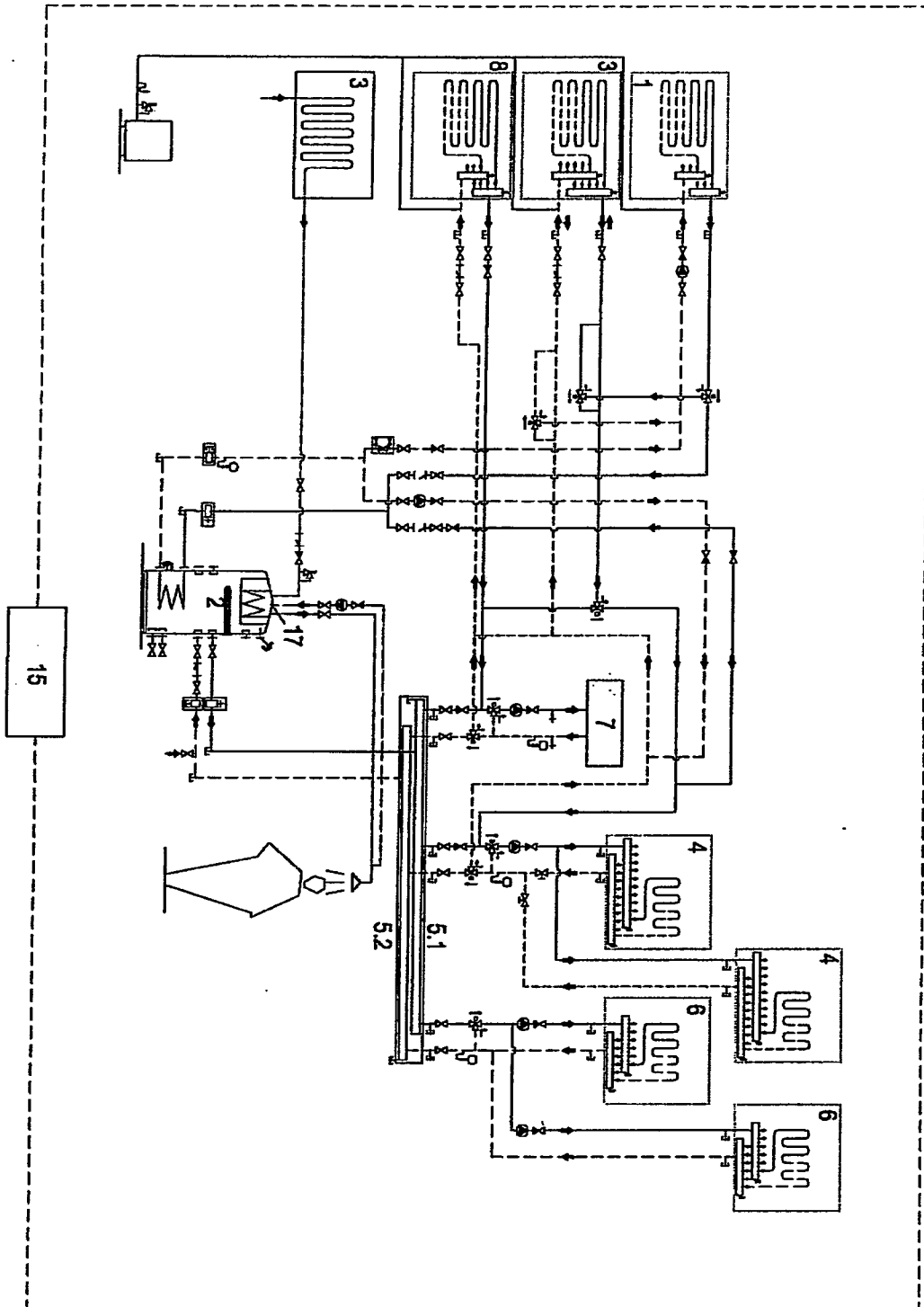


Fig 10

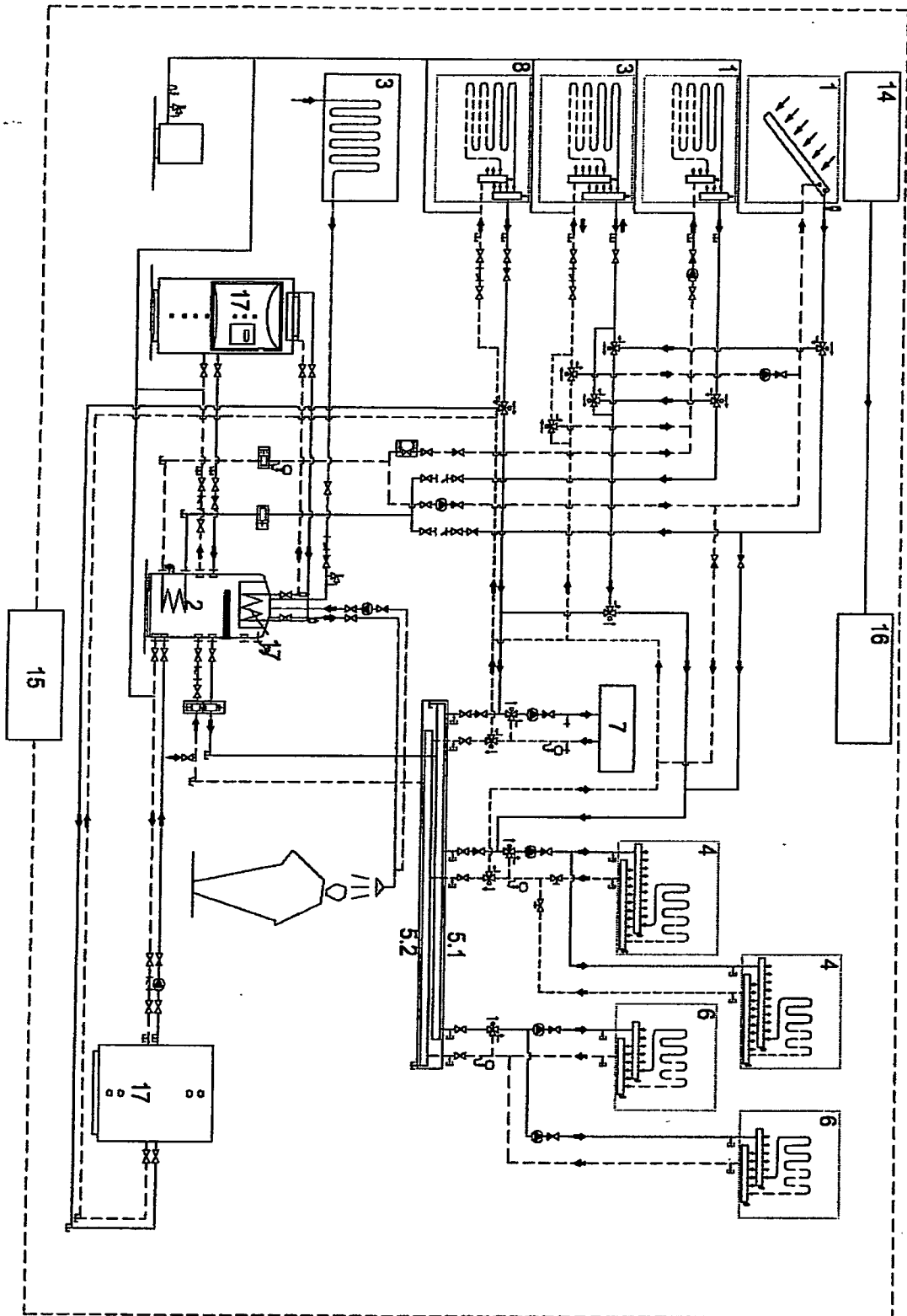


Fig 11

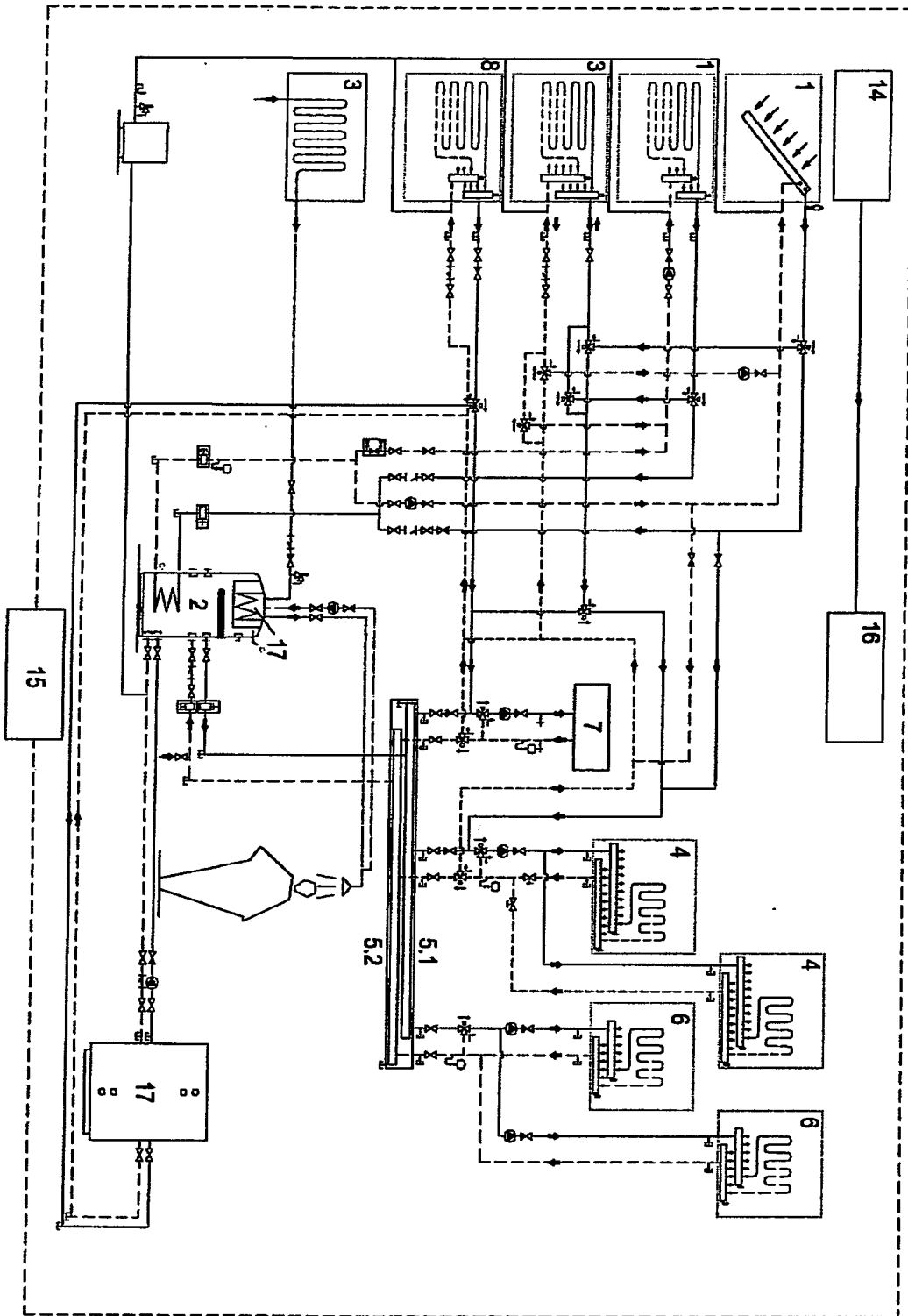


Fig 12

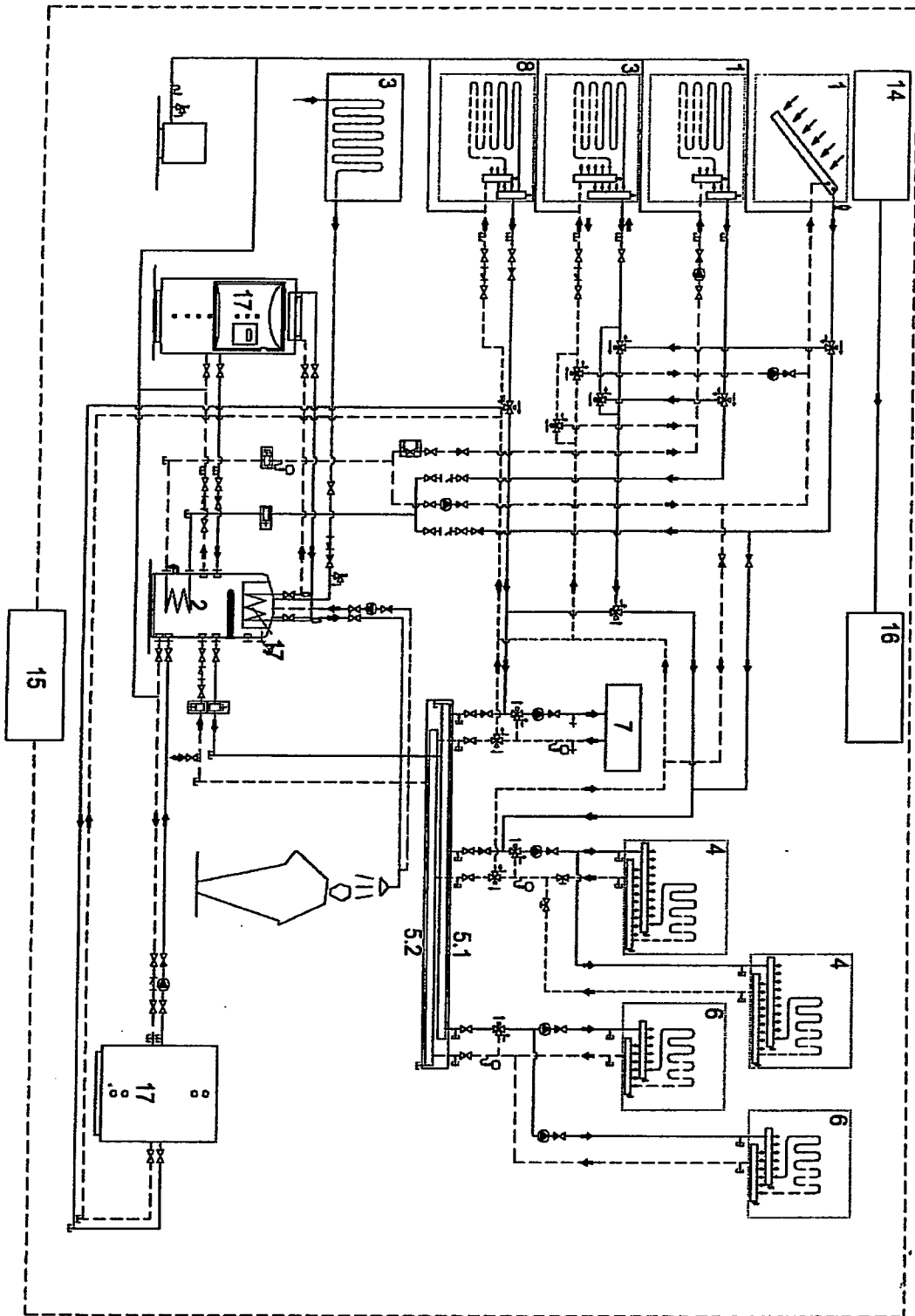


Fig 13