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(54) Title: ELEVATOR HOISTWAY

(57) Abstract: The object of the invention is an elevator hoistway, at least one wall section of which is in connection with incoming solar radiation (5). The aforementioned wall section is made to be electromagnetic radiation absorbent, for collecting incoming solar radiation (5) in the wall structure (1).

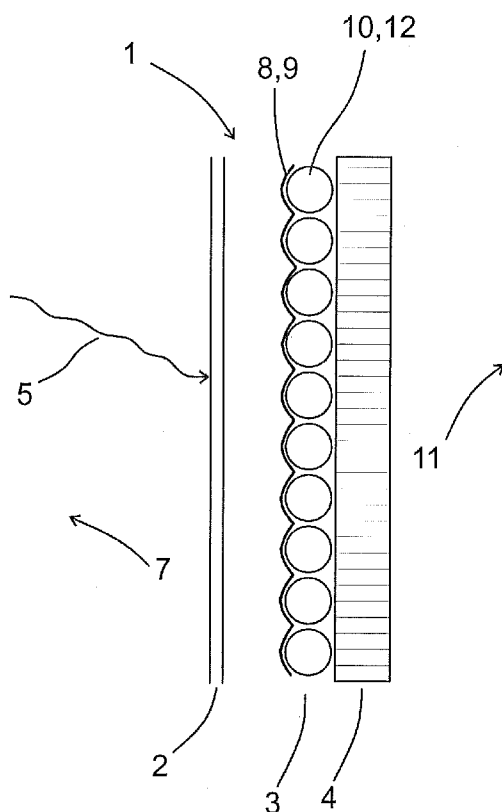


Fig. 2



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ELEVATOR HOISTWAY

The object of the invention is an elevator hoistway as defined in the preamble of claim 1 and a method as defined in the
5 preamble of claim 18.

When a new elevator with elevator hoistway is constructed onto the exterior of a building, the building receives a new wall surface. A popular wall surface structure is a steel
10 framework, which is covered with large glass surfaces. A problem with this type of glass surface is the radiant heat of the sun that it allows through, which heats the elevator hoistway repeatedly and might thus damage various components and structures of the elevator.

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Reflective glass surfaces, which reflect the radiation of the sun to outside the elevator hoistway as efficiently as possible, can be used to reduce radiant heat. These types of reflective surfaces, however, warm up the ground surface in
20 the neighborhood of the elevator hoistway, the nearby walls and apartments of the building, and cause and increase both the need for artificial irrigation and the need for cooling in nearby apartments.

25 Reflected solar radiation can also be a direct nuisance e.g. to motorists; on the other hand, reflected light is often polarized, and this type of polarized light also interferes with the orientation of many animals, such as of birds.

30 Publication JP 2002265167 A presents an elevator hoistway wherein the heating problem caused by solar radiation is solved by adding a separate screen to the outside of the elevator hoistway, which screen prevents the passage of sunlight into the elevator hoistway.

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The purpose of this invention is to eliminate the aforementioned drawbacks as well as the drawbacks disclosed in the description of the invention below. Thus an elevator

hoistway is presented as an invention, which elevator hoistway does not however cause the typical heat problems and reflection problems of an elevator hoistway but instead collects and stores thermal energy for some other use. The
5 elevator hoistway according to the invention is characterized by what is disclosed in the characterization part of claim 1. The method according to the invention is characterized by what is disclosed in the characterization part of claim 18. Other embodiments of the invention are characterized by what is
10 disclosed in the other claims.

Some inventive embodiments are also discussed in the descriptive section of the present application. The inventive content of the application can also be defined differently
15 than in the claims presented below. The inventive content may also consist of several separate inventions, especially if the invention is considered in the light of expressions or implicit sub-tasks or from the point of view of advantages or categories of advantages achieved. In this case, some of the
20 attributes contained in the claims below may be superfluous from the point of view of separate inventive concepts. Likewise the different details presented in connection with each embodiment can also be applied in other embodiments. In addition it can be stated that at least some of the
25 subordinate claims can in at least some situations be deemed to be inventive in their own right.

At least one wall section of the elevator hoistway according to the invention is in connection with incoming solar
30 radiation. The aforementioned wall section is made to be electromagnetic radiation absorbent, for collecting incoming solar radiation in the wall structure. In this case the electromagnetic radiation absorbent material to be used can be a selective absorption coating, which absorbs thermal
35 radiation but does not release it outwards. Often a material is used that also absorbs the wavelengths of visible light, in which case this type of absorbent material comprises a layer that looks from the outside black. For example, a black

nickel coating or a chrome coating, titanium oxynitride or also black paint can be used as an absorbent material. In this case at best as high as ninety percent or more of the incoming radiation can be absorbed.

5

In one embodiment of the invention a sinuous pipe is fitted into the wall structure in connection with the absorbent material in a manner that enables the transfer of heat, which pipe is filled with a heat-storing flowing substance, for
10 transferring radiant energy collected in the wall structure out of the wall structure. The transfer of heat becomes more efficient when the sinuous pipe fills the space reserved for it in the wall structure as efficiently as possible. For example, a water-glycol mixture can be used as a heat-storing
15 flowing substance; heat can also be bound in the phase change of a material, e.g. when alcohol vaporizes.

In one embodiment of the invention the wall structure comprises at least two nested layers, of which the innermost
20 layer is made to be a heat barrier, the purpose of which is to prevent the radiant energy collected in the outer layer from passing into the elevator hoistway.

In one embodiment of the invention the outermost surface layer
25 of the elevator shaft is made to be permeable to electromagnetic radiation, and the refraction index of the outermost layer is greater than the refraction index of the surrounding air, for collecting incoming solar radiation in the wall structure. In this case a material with a refraction
30 index of electromagnetic radiation having a low imaginary part is then used in the surface layer of the wall structure. The aforementioned type of material does not absorb radiation as heat at all, but instead allows the radiation to pass through. One such material is low-ferrous glass. For example,
35 a possible four-millimeter thick low-ferrous glass layer absorbs only approx. ten percent or less of the incoming solar radiation. The glass can also be structured or coated with a prior-art method such that the surface layer of the

elevator hoistway lets solar radiation arriving from outside through it but prevents heat radiation passing from the wall structure back to the outdoor air.

5 By means of the solution according to the invention the solar radiation arriving in the wall structure of an elevator hoistway can be utilized as an energy source of the building, e.g. in heating the building or as a heat source for service water. In this case in Finland, for example, by means of the
10 solution according to the invention up to ten percent of the total thermal energy consumption of a typical apartment block can be covered; the benefit achieved will also increase the farther south the solution is applied.

15 In one embodiment of the invention at least one wall section of the elevator hoistway comprises three nested layers. Each of the aforementioned layers is fitted to process radiant energy arriving via the outermost layer, in which case the outermost surface layer of the elevator hoistway is made of a
20 material that absorbs electromagnetic radiation only weakly, and the refraction index of which is essentially greater than the refraction index of the external air of the hoistway, for collecting incoming solar radiation in the wall structure of the elevator hoistway. The middle layer comprises a material
25 having an absorption capacity that is essentially greater than the outermost layer, for absorbing radiation coming into the wall structure in the middle layer. The innermost layer comprises thermal insulation, the purpose of which is to prevent the radiant energy collected in the wall structure
30 from passing into the elevator hoistway.

In one embodiment of the invention at least two sinuous pipes are fitted into the wall structure in connection with the absorbent material in a manner that enables the transfer of
35 heat. A supply pipe is fitted in connection with the wall structure, for supplying a heat-storing flowing substance into the wall structure. The aforementioned at least two sinuous pipes are fitted to be connected to the same supply pipe of a

heat-storing flowing substance, for equalizing the temperature of the wall structure. When the cold flow arriving in the sinuous pipe of the wall section is led directly to a number of different points of the wall structure of the elevator
5 hoistway, the distribution of temperature in the wall structure is more even because the material flowing in the sinuous pipe in the wall structure heats up more the longer the distance in the wall structure that it travels. An even temperature distribution of the wall structure also reduces
10 the passage of heat through the thermal insulation into the elevator hoistway. It can further be indicated that an even temperature distribution in the sinuous pipe passing around in the wall structure improves the efficiency ratio of heat recovery because the transfer of heat from the absorbent
15 material to the heat-storing substance flowing in the pipe is more efficient the greater is the temperature difference between the absorbent material and the substance flowing in the pipe. If at least two wall elements are disposed in the vertical direction at least partly at different heights with
20 respect to each other, the temperature division also in the vertical direction of the wall structure is more even. Since the waste heat in the elevator hoistway generally rises to the top part of the elevator hoistway, the formation of temperature differences in the elevator hoistway can also in
25 this case be reduced.

In one embodiment of the invention a wall section of the elevator hoistway is made of one or more wall elements, which wall elements comprise a sinuous pipe fitted in connection
30 with an electromagnetic radiation absorbent material in a manner that enables heat transfer. The pipe comprises an input into the pipe for a flowing heat-storing flowing substance, as well as an output out of the pipe for the flowing heat-storing substance. This type of prefabricated element is easy to
35 install and replace, especially if the pipe joints for the outputs and inputs of the pipe are made in the manufacturing phase of the element.

In one embodiment of the invention the support structure of the elevator hoistway is a framework, comprising vertical elements that are connected to each other with horizontal elements. In this case the aforementioned wall element is fitted into the space between the vertical elements and the horizontal elements in the framework. This kind of framework is self-supporting and additionally it can easily be fixed to the structures of the building at suitable points, such as at the points of the floor levels. Guide rails can be fitted inside the framework for guiding the movement of the elevator car. The combination of the framework and wall elements is also quick to assemble on site into an elevator hoistway. In one embodiment of the invention, guide rails are fixed inside the framework for guiding the movement of the elevator car. In one embodiment of the invention vertical guide rail bases are fixed to the framework, for fixing the guide rails. Instead of a framework, the wall section of the elevator hoistway can also be made e.g. of concrete, such that recesses for the wall elements are cast in the wall section made of concrete.

20

In one embodiment of the invention the wall section of the elevator hoistway comprises at least two wall elements, and a supply pipe is fitted in connection with the wall section for supplying a heat-storing flowing substance into the wall elements. The inputs of the sinuous pipes of the aforementioned wall elements are connected to the same supply pipe, for equalizing the temperature difference between wall elements. When the cold flow arriving in the wall section of the elevator hoistway is led directly to a number of different elements, the distribution of temperature in the wall structure is more even. Furthermore, an even temperature distribution of the wall structure reduces the passage of heat through the thermal insulations of the wall elements into the elevator hoistway. Likewise, a more even heat distribution among the wall elements improves the efficiency ratio of heat recovery.

In one embodiment of the invention a supply pipe is fitted in connection with a wall section, for supplying a heat-storing flowing substance into the wall structure, and also a output pipe for the heat-storing substance returning from the wall structure. The aforementioned supply pipe and output pipe are taken from the wall structure to the water storage tank. The water storage tank functions in this case as a store, into which store the radiant energy collected in the wall structure is transferred via a heat exchanger through the heat-storing flowing substance. Energy from the water storage tank can be transferred onwards to elsewhere in the building. The wall structure cools as the heat energy is transferred from the wall structure to the water storage tank.

In one embodiment of the invention a first temperature sensor is fitted in connection with the reservoir of the water storage tank, a second temperature sensor is fitted in connection with the sinuous pipe of the wall section, and a controllable pump is fitted in connection with the output pipe. A data line is made between the first temperature sensor, the second temperature sensor and the control circuit of the pump, and the pump is controlled as a response to the temperature difference indicated by the measuring signals of the first and the second temperature sensors. Thus, when controlling the pump the circulation speed of the heat-storing flowing substance can be changed and at the same time the cooling of the wall structure controlled according to changing solar radiation conditions such that the circulation speed of the substance circulating in the wall structure is increased as the radiation power of the solar radiation increases.

In one embodiment of the invention at least two sinuous pipes are fitted into the wall structure in connection with the electromagnetic radiation absorbent material. The aforementioned second temperature sensor is fitted at the point of the first sinuous pipe. A third temperature sensor is further fitted at the point of the second sinuous pipe. A data

line is made between the third temperature sensor and the control circuit of the pump, and the pump is controlled as a response to the temperature difference indicated by the measuring signals of the first, second and third temperature
5 sensors, for evening out the temperature of the wall structure. In this case the circulation speed of the flowing heat-storing substance can be e.g. increased if the temperature of the flowing substance in an individual sinuous pipe grows too high, in which case the efficiency ratio of
10 heat recovery improves. At the same time the transfer of heat from the wall structure to the elevator hoistway decreases. Furthermore, it is possible to fit a remote-controlled valve into the flow channel of at least one sinuous pipe, in which case with the control of the valve the flow of liquid in an
15 individual pipe can be stopped. When stopping the flow of liquid it is possible to cool only a part of the wall structure at a time.

One advantage of the solution according to the invention is
20 that is possible by using it to manufacture serially-produced standard-model elevator hoistways of different sizes, which are easy to install in different buildings also retroactively. The manufacturing costs of serially-produced standard-model support structures and wall elements of elevator hoistways are
25 also low. According to the invention, also the hoisting machine and/or the power supply apparatus of the elevator motor can if necessary be disposed in the elevator hoistway without the heating problems conventionally caused particularly by a glass hoistway.

30

In the following, the invention will be described in more detail by the aid of some embodiment examples with reference to the attached drawings, wherein

- 35 Fig. 1 presents an oblique top and side view of one elevator hoistway according to the invention,
Fig. 2 presents one wall structure of an elevator hoistway according to the invention,

Fig. 3 presents the circulation of a heat-storing substance in one embodiment of the invention,

Fig. 4 presents the collection of radiant energy in one wall structure according to the invention.

5

Fig. 1 presents one steel framework 17 of an elevator hoistway according to the invention to be installed onto the exterior of a building, viewed obliquely from the side and top. The steel framework comprises vertical elements 18 that function
10 as vertical pillars fitted into the vertical position in the corners of the hoistway, which vertical elements are assembled from beams fitted one on top of the other, which are manufactured e.g. from steel plate by roll forming a plate into a certain profile, which withstands a load well and does
15 not buckle easily.

The vertical elements are connected to each other with screw fixings by means of the essentially horizontal support beams 19.

20

The elevator hoistway is assembled from standardized-like parts with screw fixings and is essentially self-supporting and it is additionally fixed with screw fixings at suitable points to the structures of the building in locations that
25 provide the most possible support, e.g. to the points of the floor levels. No defined location in the hoistway structure is needed for fixing points, in which case the fixing screws can be fastened to just such a suitable place that contains a good and supportive counterfixing location in the structures of the
30 building.

In addition, vertically aligned guide rail bases 27 are fixed to the first side of the elevator hoistway, which are assembled from beams fitted one on top of the other and fixed
35 to each other with screw fixings in the manner of the vertical elements 18. Additionally, the bottom part of the elevator hoistway contains a plinth 29 going around the hoistway, which

is assembled e.g. from steel plates, which are fixed with screws or rivets to the vertical elements 18.

In addition, the elevator hoistway comprises, depending on the situation, wall panels supported on the vertical elements 18 and/or on the horizontal elements 19, which can be e.g. transparent glass panels or opaque wall panels. The wall panels and other cladding can also be installed in the hoistway later. Heat-collecting wall elements 6 are installed on at least the essentially south-facing wall of the elevator hoistway, front and top views of which elements are presented in the small figures. The outermost layer 2 of the wall elements is made of low-ferrous glass. The structure of the wall element comprises three nested layers 2, 3, 4. The outermost layer 2 made of low-ferrous glass absorbs only less than ten percent of the incoming solar radiation, in which case it collects the incoming solar radiation 5 in the wall structure 1 of the elevator hoistway. A thin sheet made of stainless steel is fitted to the middle layer 3, which sheet is coated with titanium oxynitride 8, the selective absorption capacity of which enables over 90% of the incoming radiation on the sheet to be absorbed, but emits back only less than 10% as heat radiation. A sinuous copper pipe 10, in which a water-glycol mixture flows, is fitted in connection with the coated sheet 9 in a manner that conducts heat. Heat is transferred from the coated sheet into the water-glycol mixture flowing in the copper pipe, in which case the flow cools the wall element 6. The innermost layer 4 of the wall element is made of glass wool, the purpose of which is to prevent the radiant energy collected in the element from passing into the elevator hoistway 11. In addition to a glass wool layer, a reflective surface 4', the purpose of which is to reflect incoming radiant energy away from the elevator hoistway 11, can also be used as a thermal insulation.

The heat-collecting wall element 6 also comprises pipe joints 15, 16, by means of which the wall element is connected to a water-glycol mixture supply pipe and output pipe.

- 5 The wall elements 6 are fixed to the vertical elements 18 of the elevator hoistway with fixing elements 30.

The elevator machine, with traction sheave, that moves the elevator car as well as the frequency converter that supplies
10 power to the elevator motor are fitted into the top part of the elevator hoistway. The elevator machine is directly or indirectly fixed to the guide rails and the frequency converter is fixed to a wall structure of the elevator hoistway.

15

According to the invention the heat-collecting wall elements 6 can be fitted in other walls of the elevator hoistway than in the southmost facing wall described in the embodiment. At least a part of the wall elements 6 can be positioned at
20 essentially the same height with respect to each other.

Fig. 3 presents the circulation of a water-glycol mixture e.g. in the elevator hoistway according to Fig. 1. Two heat-collecting wall elements 6, 6', which are disposed at
25 different heights, are in this case fitted according to the figure to the wall section of the elevator hoistway. A supply pipe 13, from where cold water-glycol mixture is supplied to both the wall elements 6, 6', is fitted in connection with the wall section. An output pipe 14, via which warmed water-glycol
30 mixture exits the wall elements, is also fitted in connection with the wall section. The supply pip,
3e and output pipe are thermally insulated, and they are enclosed. Since the water-glycol mixture passes in this case through only one heat-collecting wall element 6, 6' before
35 exiting the wall structure, the heat has been distributed very evenly in the wall structure.

The supply and output pipes 13, 14 are taken from the wall elements 6, 6' to the water storage tank 21. The heat from the output pipe 14 is transferred to the water storage tank 21 with a heat exchanger. A first temperature sensor 22 is fitted in connection with the water storage tank, and a second temperature sensor 23 is fitted in connection with the heat-absorbing middle layer 3 of at least one wall element 6, 6'. A controllable pump 24 is fitted in connection with the output pipe 13. The aforementioned temperature sensors 22, 23 are connected to the control circuit 25 of the pump with measuring cables. The control circuit 25 of the pump thus determines the temperature of the water storage tank 21 and also the temperature of the water-glycol mixture in the middle layer 3 of the wall elements, and as the temperature difference between these increases to be larger than a set limit value the control circuit 25 starts the pump, in which case warmed water-glycol mixture exits from the wall elements 6, 6', and colder mixture flows into the space cooling the wall element.

The water storage tank 21 is in connection with another hot water system of the building, in which case the heat collected in the water storage tank can be used for heating the building and as warm service water.

It is also possible that at least two of the heat-collecting wall elements 6, 6' are connected to each other in series such that the output 16 of the sinuous pipe 10 of the first wall element 6 is taken with a connecting pipe to the input 15' of the sinuous pipe 10' of the second wall element 6'.

30

Fig. 4 presents the collection of radiant energy in one wall element 6 according to the invention. Solar radiation 5 coming from outside meets the low-ferrous glass 2, and because the refraction index of the glass is greater than the surrounding air, the solar radiation is for the most part refracted into the wall element; only a small part of the radiation is reflected back. The radiation that has arrived in the element is absorbed for the most part into the absorbent coating of

the middle layer 3. The coating is thus selective, so that it reflects only a small part back as heat radiation. The coating is on a thin steel sheet. The thermal conductivity of this type of steel sheet is high. The heat thus absorbed is efficiently transferred into the copper pipe that is connected to the steel sheet in a thermally conductive manner, and onwards into the water-glycol mixture circulating in the copper pipe. The larger the temperature difference is between the steel sheet and the water-glycol mixture, the more efficient is the transfer of heat. Since the innermost layer 4 of the wall element is made of thermal insulation, only a small part of the radiant energy collected in the wall elements 6 passes into the elevator hoistway 11.

The heat-collecting wall elements 6 can if necessary also be disposed in the roof structure of the elevator hoistway, in which case the efficiency of the system can be further improved.

It is obvious to the person skilled in the art that the invention is not limited solely to the examples described above, but that it may be varied within the scope of the claims presented below.

It is further obvious to the person skilled in the art that the elevator hoistway according to the invention is applicable to an elevator system with counterweight as well as to an elevator system without counterweight.

It is further obvious to the person skilled in the art that if necessary the elevator hoistway is provided with e.g. a sheet steel roof binding the vertical elements together and with diagonal supports that strengthen the top end of the hoistway. This kind of structure must be made e.g. when the guide rails cannot be supported at their top ends by the structures of the building.

CLAIMS

1. Elevator hoistway, at least one wall section of which is in connection with incoming solar radiation (5), **characterized** in that the aforementioned wall section is made of electromagnetic radiation absorbent material, for collecting incoming solar radiation in the wall structure (1).
2. Elevator hoistway according to claim 1, **characterized** in that a sinuous pipe (10) is fitted into the wall structure (1) in connection (3) with the absorbent material (8) in a manner that enables the transfer of heat, which pipe is filled with a heat-storing, flowing substance (12), for transferring radiant energy collected in the wall structure out of the wall structure.
3. Elevator hoistway according to claim 1 or 2, **characterized** in that the wall structure comprises at least two nested layers (3, 4), of which the inner layer is made to be a heat barrier, the purpose of which is to prevent the radiant energy collected in the outer layer from passing into the elevator hoistway (11).
4. Elevator hoistway according to any of claims 1 - 3, **characterized** in that the outermost surface layer (2) of the elevator hoistway is made to be permeable to electromagnetic radiation, and in that the refraction index of the outermost layer is greater than the refraction index of the surrounding air (7), for collecting incoming solar radiation (5) in the wall structure (1).
5. Elevator hoistway according to any of claims 1 - 4, **characterized** in that at least two sinuous pipes (10, 10') are fitted into the wall structure (1) in connection (3) with the absorbent material (8) in a manner that enables the transfer of heat;
a supply pipe (13) is fitted in connection with the wall structure, for supplying a heat-storing flowing substance (12) into the wall structure (1);
and in that the aforementioned at least two sinuous pipes (10, 10') are fitted to be connected to the same supply pipe (13).

of a heat-storing flowing substance, for equalizing the temperature of the wall structure.

6. Elevator hoistway according to claim 5, **characterized** in that at least two sinuous pipes (10, 10') are disposed in the vertical direction at least partly at different heights with respect to each other.

7. Elevator hoistway according to any of the preceding claims, **characterized** in that the aforementioned wall section of an elevator hoistway is made of one or more wall elements (6, 6');
10 6');

which wall elements comprise a sinuous pipe (10) fitted in connection with an electromagnetic radiation absorbent material (3) in a manner that enables heat transfer, which pipe comprises an input (15) into the pipe for a heat-storing flowing substance (12), as well as an output (16) out of the pipe for the flowing heat-storing substance.

8. Elevator hoistway according to claim 7, **characterized** in that a wall section of the elevator hoistway is made of concrete, and in that a recess for a wall element is cast in the aforementioned wall section made of concrete.

9. Elevator hoistway according to claim 7, **characterized** in that the support structure of the elevator hoistway is a framework (17), comprising vertical elements (18) that are connected to each other with horizontal elements (19);
25 and in that the aforementioned wall element (6, 6') is fitted into the space between the vertical elements and the horizontal elements in the framework (17).

10. Elevator hoistway according to any of claims 7 - 9, **characterized** in that a wall section of the elevator hoistway comprises at least two wall elements (6, 6');
30 comprises at least two wall elements (6, 6');

and in that a supply pipe (13) is fitted in connection with the wall section for supplying a heat-storing substance into the wall elements (6, 6');

and in that the inputs (15, 15') of the sinuous pipes (10, 10') of the aforementioned wall elements are connected to the same supply pipe (13), for equalizing the temperature difference between wall elements.

11. Elevator hoistway according to claim 10, **characterized** in that at least two of the wall elements (6, 6') are disposed at least partly at different heights.

12. Elevator hoistway according to claim 9, **characterized** in
5 that guide rails are fixed to the aforementioned framework (17) for guiding the movement of the elevator car.

13. Elevator hoistway according to any of the preceding claims, **characterized** in that a supply pipe (13) is fitted in connection with the wall section, for supplying a heat-storing
10 flowing substance (12) into the wall structure (3), and also an output pipe (14) for the heat-storing substance returning from the wall structure;

and in that the aforementioned supply pipe and output pipe are taken from the wall structure to the water storage tank (21).

15 14. Elevator hoistway according to claim 13, **characterized** in that a first temperature sensor (22) is fitted in connection with the reservoir of the water storage tank (22);

a second temperature sensor (23) is fitted in connection with the sinuous pipe (10, 10') of the wall section;

20 a controllable pump (24) is fitted in connection with the output pipe (13);

a data line is made between the first temperature sensor (22), the second temperature sensor (23) and the control circuit (25) of the pump;

25 and in that the pump (24) is controlled as a response to the temperature difference indicated by the measuring signals of the first and the second temperature sensors.

15. Elevator hoistway according to claim 14, **characterized** in that at least two sinuous pipes (10, 10') are fitted in the
30 wall structure in connection with the electromagnetic radiation absorbent material (3);

the aforementioned second temperature sensor (23) is fitted at the point of the first sinuous pipe (10);

the third temperature sensor (26) is further fitted at the
35 point of the second sinuous pipe (10');

a data line is made between the third temperature sensor and the control circuit (25) of the pump;

and in that the pump (24) is controlled as a response to the temperature difference indicated by the measuring signals of the first (22), second (23) and third (26) temperature sensors, for equalizing the temperature of the wall structure

5 (1).

16. Elevator hoistway according to any of the preceding claims, **characterized** in that the hoisting machine (27) of the elevator is fitted in the elevator hoistway (11).

17. Elevator hoistway according to any of the preceding
10 claims, **characterized** in that a power supply apparatus (28) of the elevator motor is fitted in the elevator hoistway (11).

18. Method for utilizing solar energy, **characterized** in that an elevator hoistway according to any of claims 1 - 17 is used for collecting and storing incoming solar radiation, and in
15 that the collected and stored energy is utilized in heating a building and/or as a heat source for hot service water..

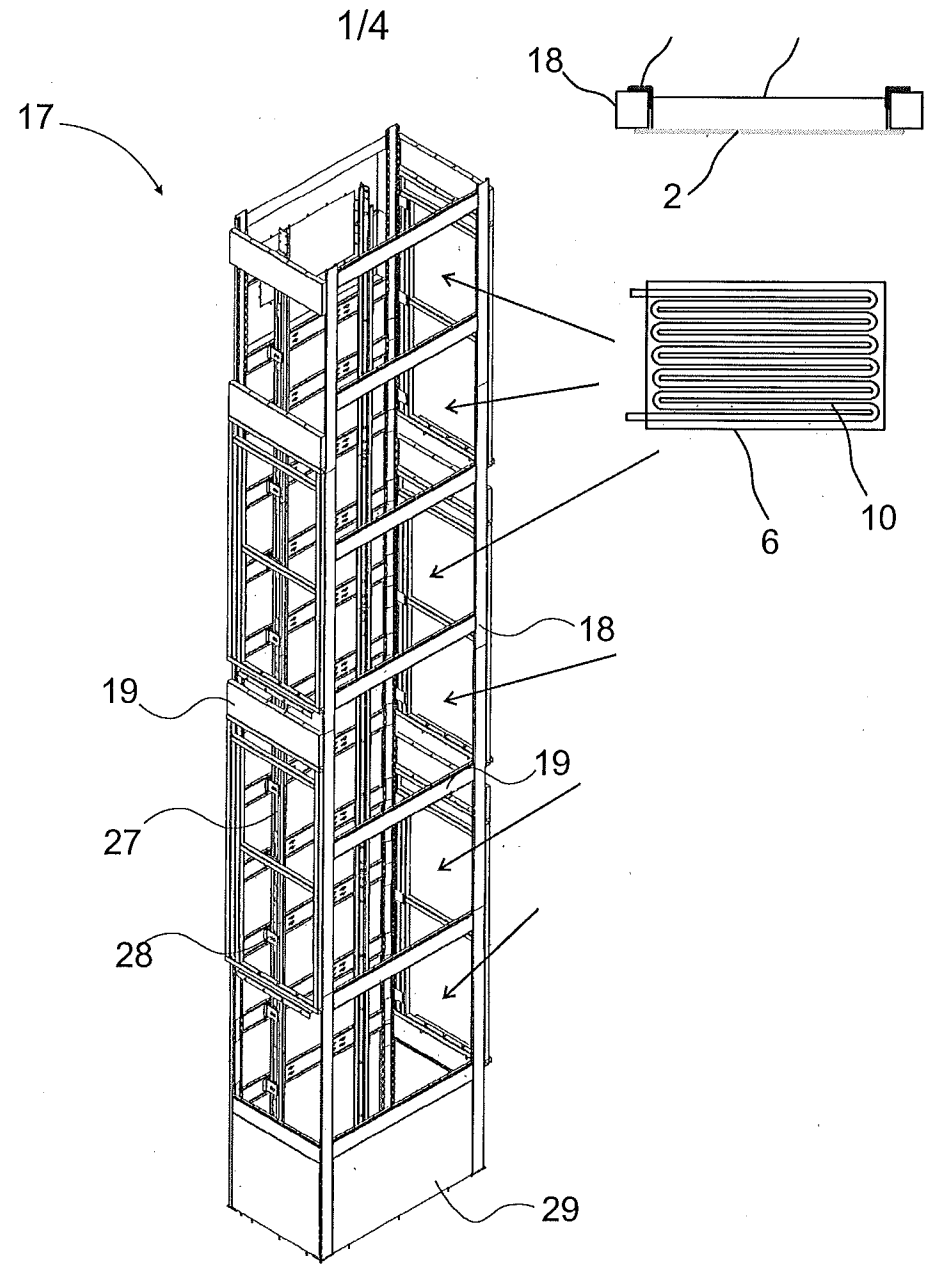


Fig. 1

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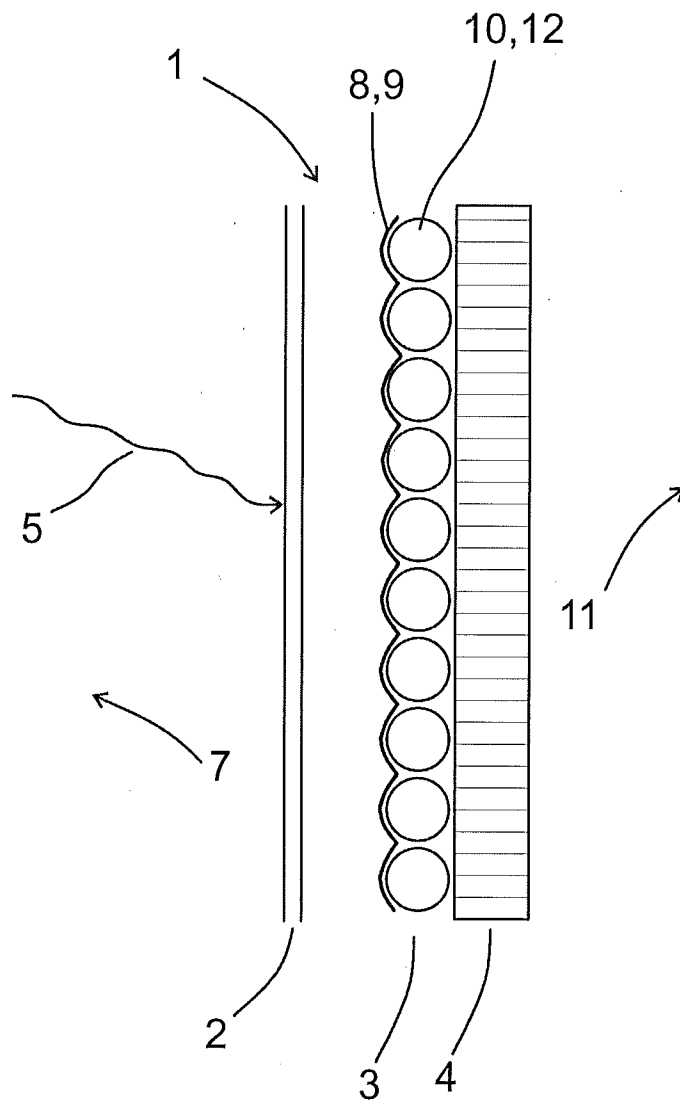


Fig. 2

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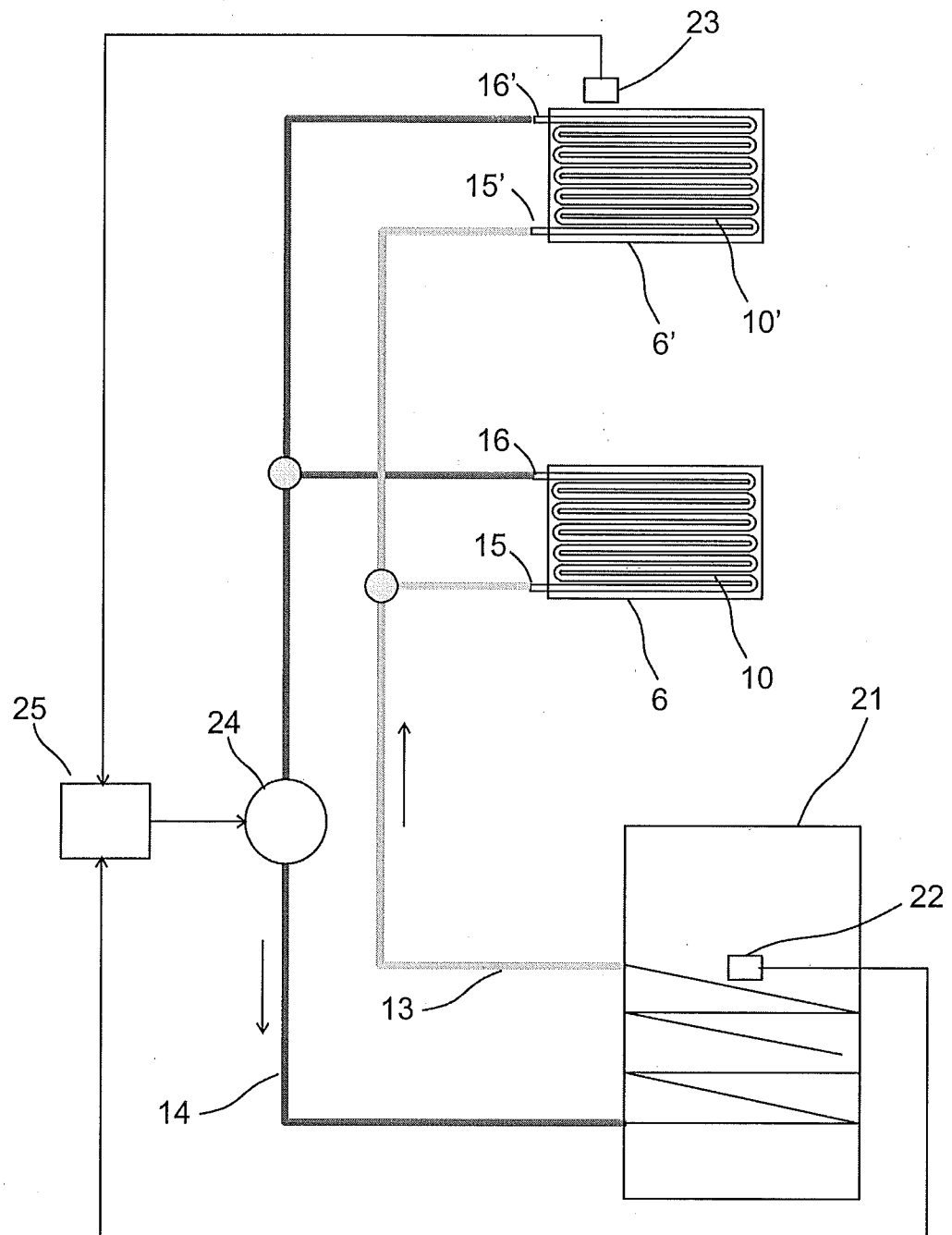


Fig. 3

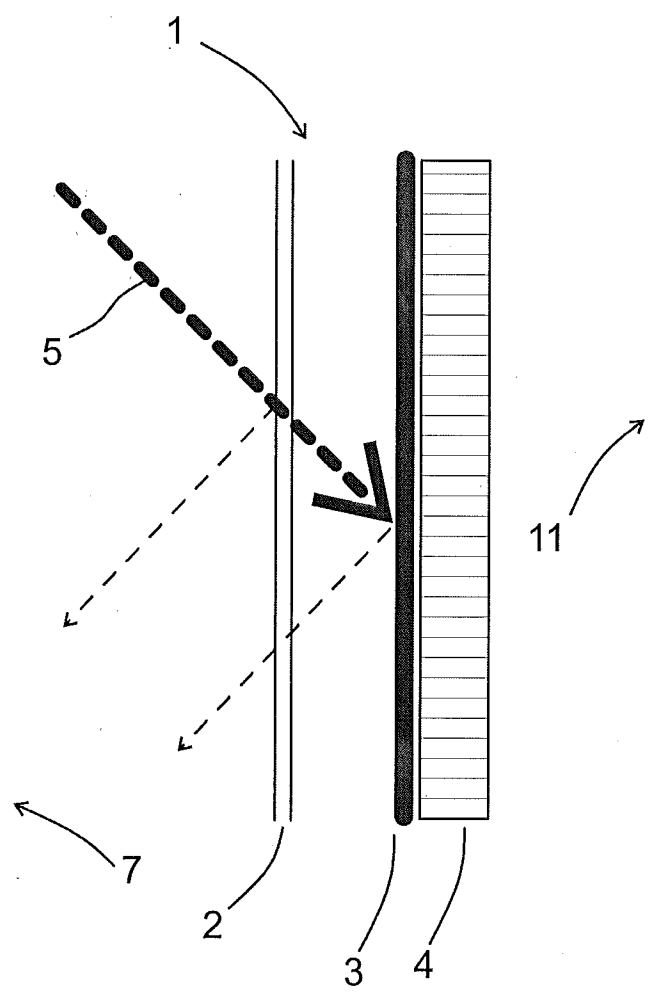


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI2010/050062

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B66B, E04F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
FI, SE, NO, DKElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 2002265167 A (HITACHI LTD et al.) 18 September 2002 (18.09.2002) figures 1-6; & abstract [online] EPOQUENET EPODOC & WPI & PAJ; & machine translation in English [online] [translated 12.04.2010] paragraphs [0021]-[0025] "Cited in the application"	1, 2, 13, 16-18 3-12, 14, 15
Y	GB 2273151 A (MCKEE FREDERICK BRIAN) 08 June 1994 (08.06.1994) page 1, paragraph 1; page 2, paragraph 2; figure 1	3, 4
Y	GB 2270559 A (CARR MICHAEL DAVID) 16 March 1994 (16.03.1994) abstract; page 6, line 17 - page 8, line 20; page 10, line 16 - page 13, line 25; figures 1 and 4	5-12
Y	US 4127103 A (KLANK BENNO E O et al.) 28 November 1978 (28.11.1978) column 7, line 33 - column 8, line 35; figure 3	14, 15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered
to be of particular relevance"E" earlier application or patent but published on or after the international
filing date"L" document which may throw doubts on priority claim(s) or which is
cited to establish the publication date of another citation or other
special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than
the priority date claimed"T" later document published after the international filing date or priority
date and not in conflict with the application but cited to understand
the principle or theory underlying the invention"X" document of particular relevance; the claimed invention cannot be
considered novel or cannot be considered to involve an inventive
step when the document is taken alone"Y" document of particular relevance; the claimed invention cannot be
considered to involve an inventive step when the document is
combined with one or more other such documents, such combination
being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

12 April 2010 (12.04.2010)

Date of mailing of the international search report

04 May 2010 (04.05.2010)

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI2010/050062

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2006017885 A1 (GOCZYNSKI BODGAN et al.) 23 February 2006 (23.02.2006) abstract; page 5, paragraphs 9 and 9.1; figure 15	14, 15

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/FI2010/050062

Patent document cited in search report	Publication date	Patent family members(s)	Publication date
JP 2002265167 A	18/09/2002	None	
GB 2273151 A	08/06/1994	None	
GB 2270559 A	16/03/1994	WO 9407193 A1 EP 0659290 A1 AU 4978893 A IL 106944 A	31/03/1994 28/06/1995 12/04/1994 18/06/1996
US 4127103 A	28/11/1978	None	
WO 2006017885 A1	23/02/2006	US 2009025709 A1 EP 1834136 A1 AU 2005274670 A1	29/01/2009 19/09/2007 23/02/2006

INTERNATIONAL SEARCH REPORT

International application No.
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CLASSIFICATION OF SUBJECT MATTER

Int.Cl.

B66B 7/00 (2006.01)

E04F 17/00 (2006.01)