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(54) **DYNAMIC HEAT ACCUMULATOR AND METHOD FOR STORING HEAT**

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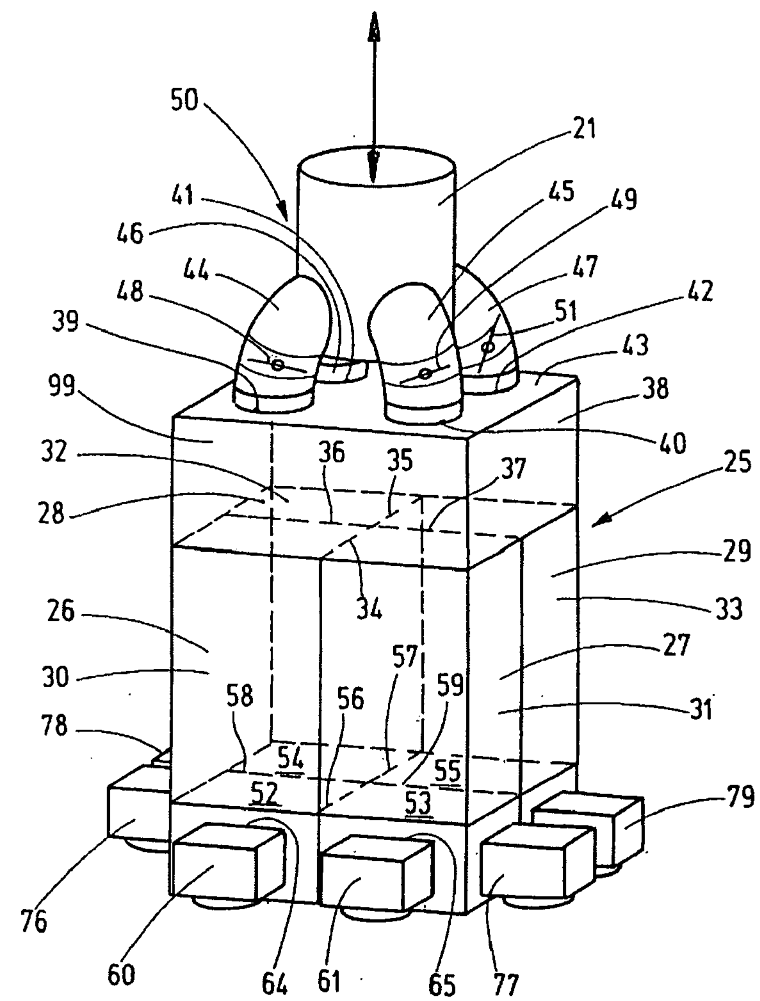
(57) **ABSTRACT**

A heat accumulator has a heat accumulator structure with at least two accumulator elements through which a medium flows for charging and that thus each forms a hot end and a cold end by temperature layering and having a medium rinse device. In a rinse operation the heat accumulator produces at least one cold medium rinse flow and introduces it into the cold end of at least one of the accumulator elements. The hot medium rinse flow exiting from the hot end of the accumulator element enters the hot end that is in the charged state via at least one rinse path.



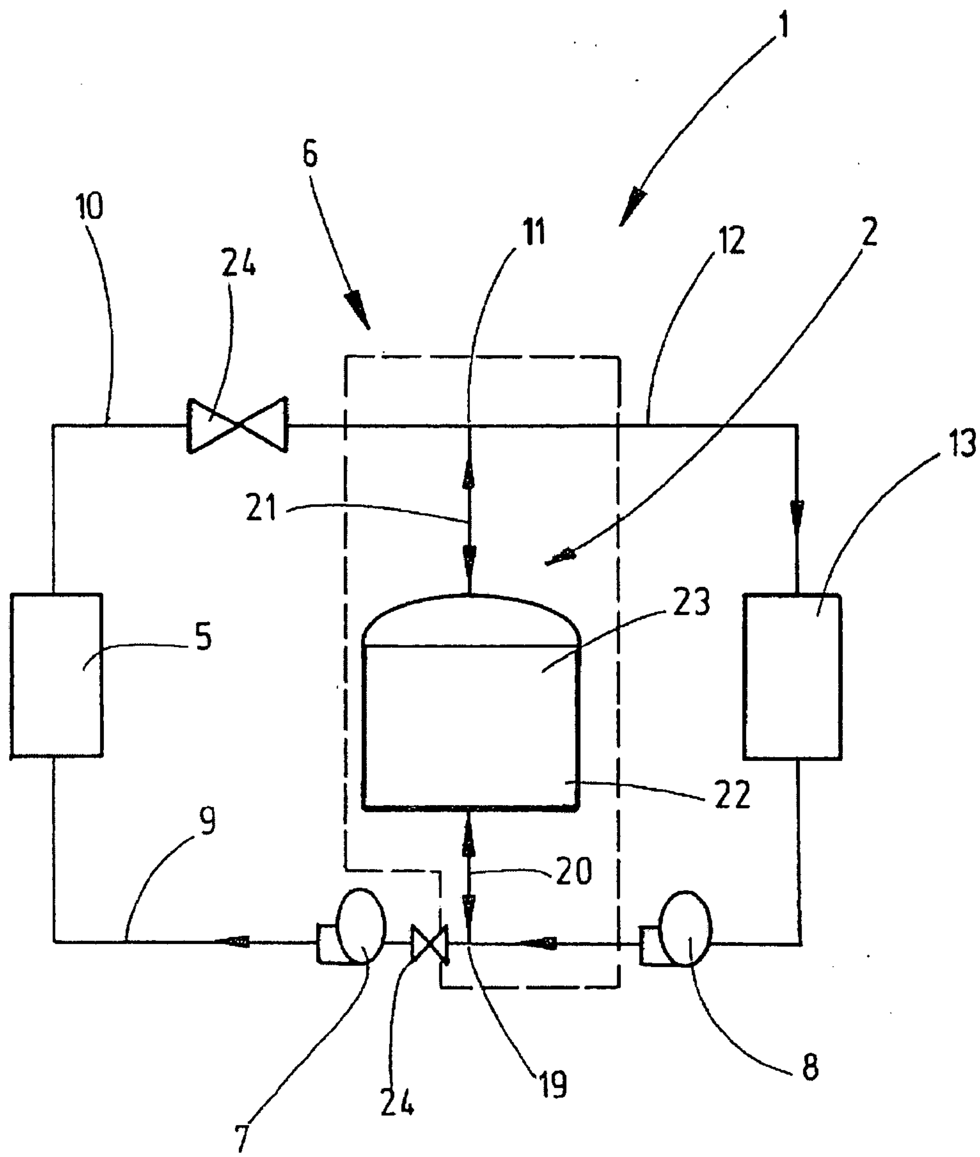


Fig.1

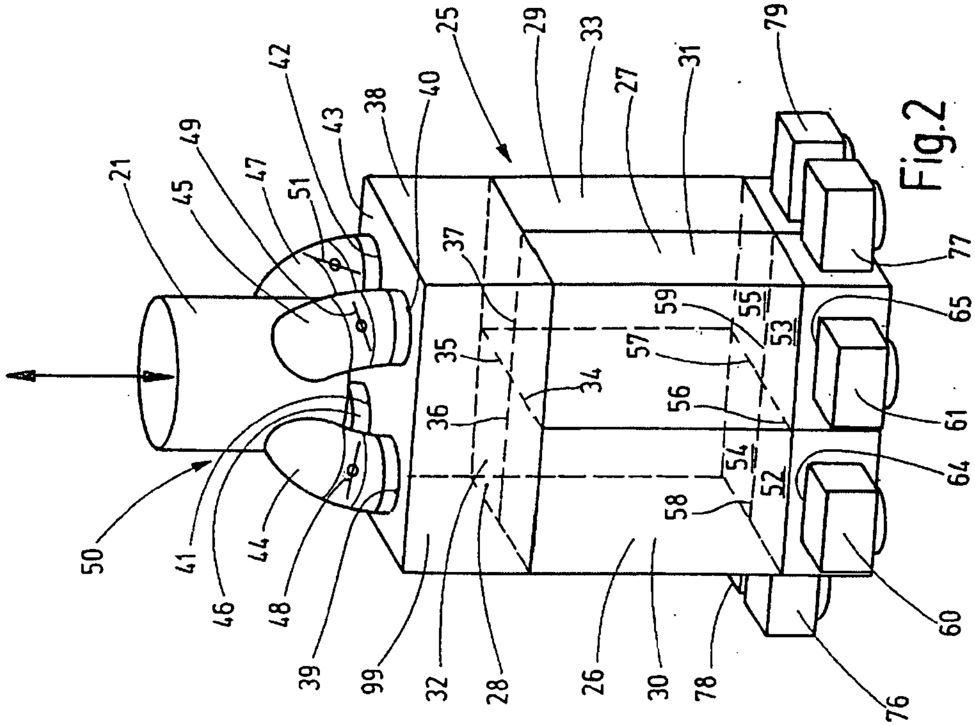


Fig.2

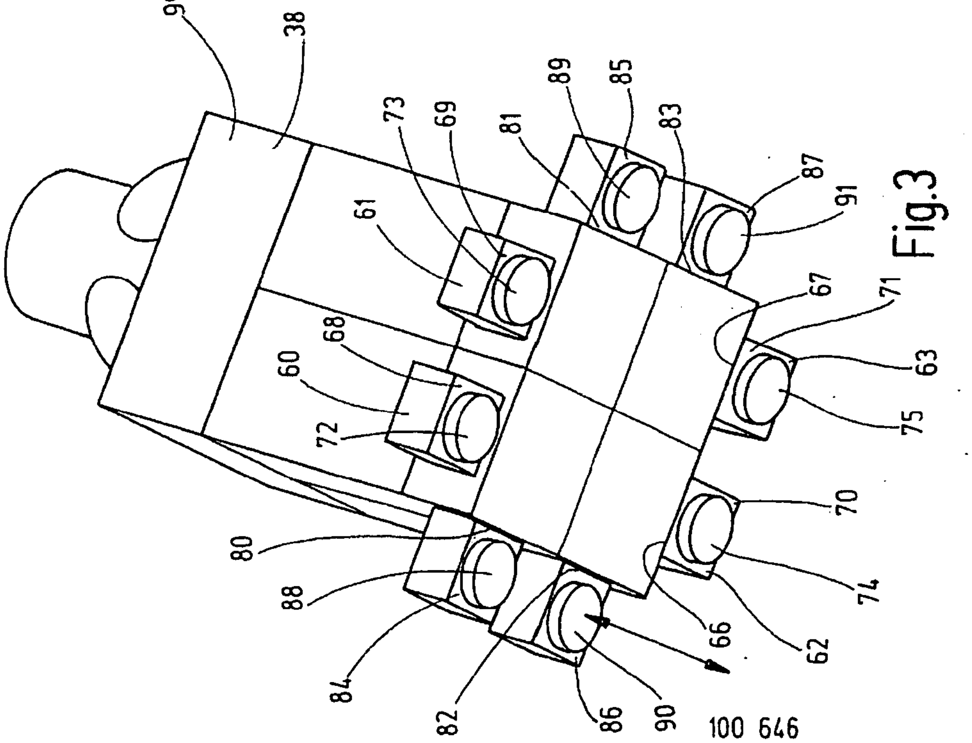


Fig.3

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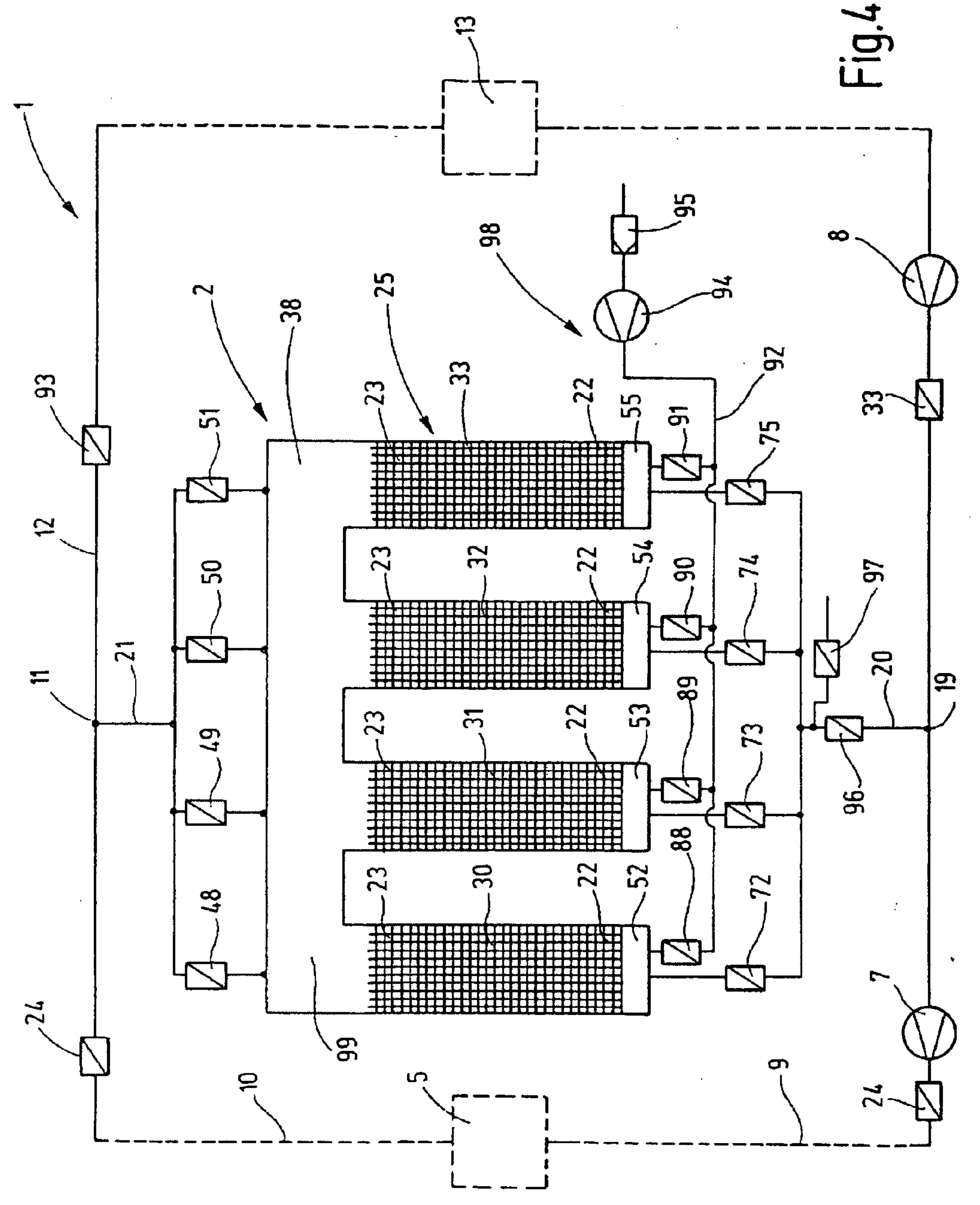
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Fig.4

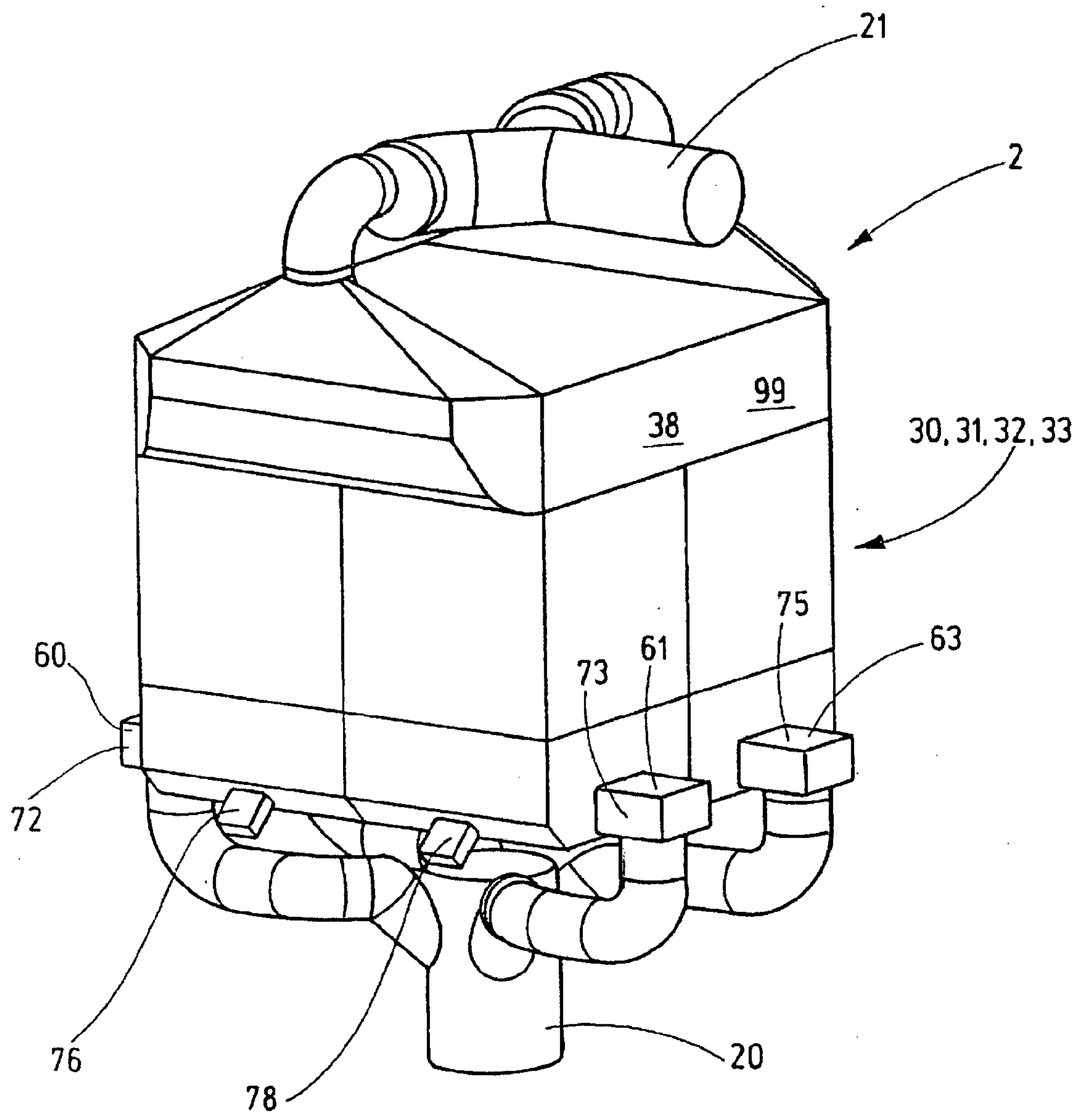

Fig.5

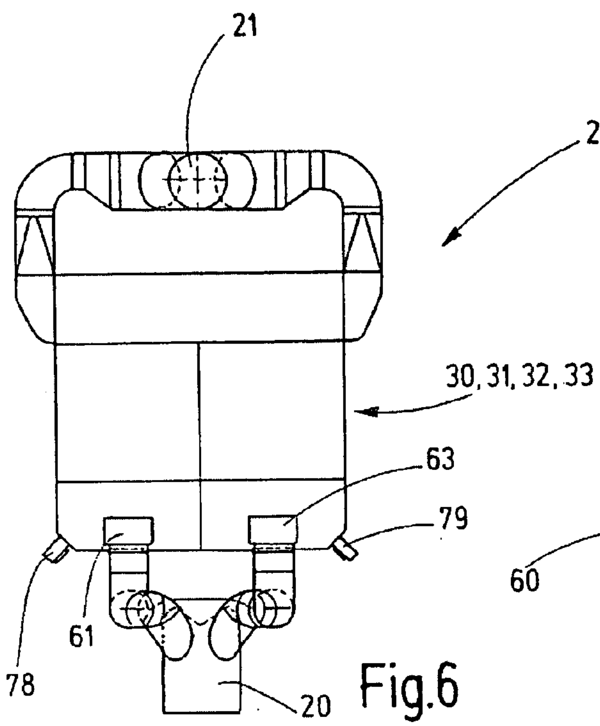

Fig.6

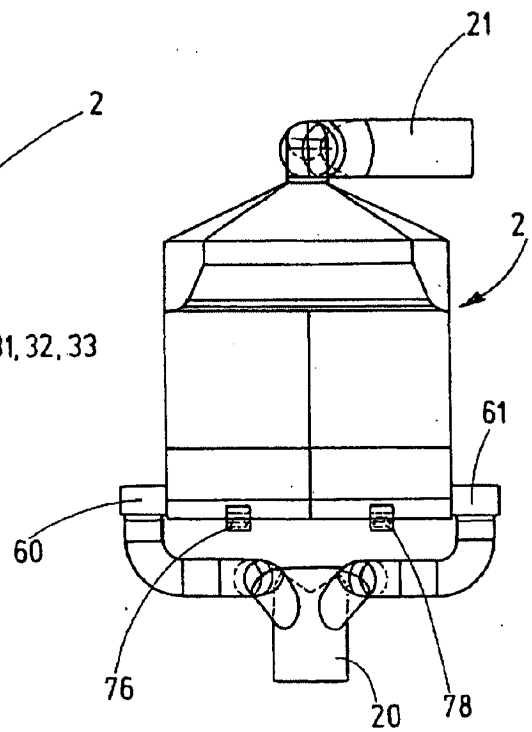

Fig.7

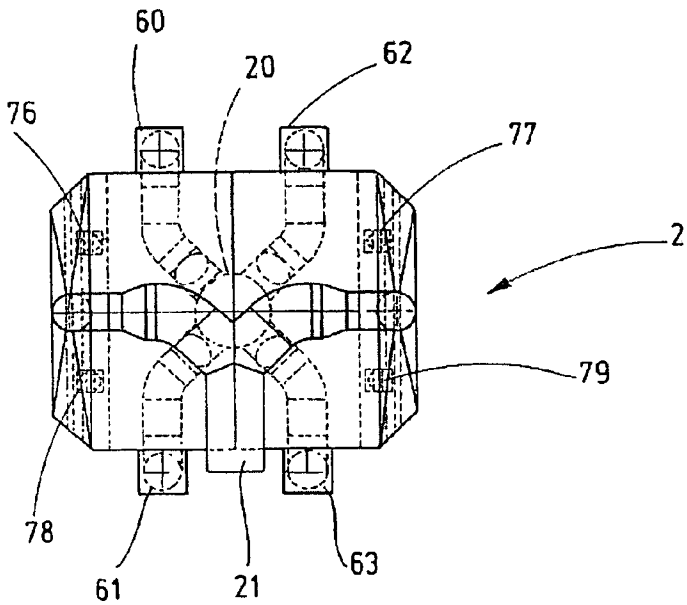

Fig.8

DYNAMIC HEAT ACCUMULATOR AND METHOD FOR STORING HEAT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to German Patent Application No. 10 2007 005 331.4 filed 29 Jan. 2007, which application is herein expressly incorporated by reference.

FIELD

[0002] The present disclosure relates to a heat accumulator having a heat accumulator structure.

BACKGROUND

[0003] The statements in this section merely provide background information related to the present disclosure and may not constitute prior art.

[0004] Heat accumulators are known that have a housing that is filled with a heat-storing material, in particular a ceramic material. For charging the heat accumulator, a hot medium flow is conducted through the material so that the latter heats up. For discharging, a cold medium flow is conducted through the hot material, so that the medium flow heats up and is available as a hot medium flow. Ceramic honeycombs in particular are used for the ceramic material. Fill and/or plates can also be used. They have a plurality of through-flow channels for the medium. Heat is added and heat is removed as a function of the energy flows during charging and discharging, and these energy flows can be of different magnitudes. This can cause local temperature increases in the heat accumulator structure of the heat accumulator. When heat is added to the heat-storing material, a heat profile occurs, that is, the heat-storing material on the input side has the highest temperature. The temperature of the heat-storing material decreases in the direction of the output of the accumulator. The same applies for the temperature distribution when heat is removed. If the accumulator is idle, that is, if no heat energy is being added or removed, the temperature equalizes from the warm side to the cold side across the volume of the heat accumulator structure.

SUMMARY

[0005] The underlying object of the invention is to create a heat accumulator having a heat accumulator structure in which a desired in particular horizontal and/or vertical temperature distribution state is maintained, even during lengthy idle periods. In particular a reproducible state is maintained so that optimum operation with high efficiency is possible.

[0006] This object is inventively attained in that the heat accumulator structure of the heat accumulator has at least two accumulator elements through which a medium flows for charging and that thus each form a "hot end" and a "cold end" by temperature layering, a medium rinse device being provided that in a rinse operation for the heat accumulator produces at least one cold medium rinse flow and introduces it into the cold end of at least one of the accumulator elements, the hot medium rinse flow exiting from the hot end of the aforesaid accumulator element entering via at least one rinse path the hot end that is in the charged state and that is of the at least one other accumulator element. Thus, the cold end of the at least one accumulator element is acted upon by means of the medium rinse flow, which in particular is produced by the medium rinse device when the heat accumulator is in the idle state. The rinse medium flow passes through the accumulator element in the opposite direction to the medium charging flow. When it flows through the accumulator element, the medium charging flow produces a heat profile, that is, the accumulator element is hotter in the input zone than in the output zone. This results in temperature layering, starting from the hot end to the cold end, the latter representing the output end of the accumulator element for the medium charging flow. If the medium rinse flow, which relative to the medium charging flow has a lower temperature, that is, is "cold", is now introduced into the cold end of the charged accumulator element, the medium rinse flow heats up as it passes through the accumulator element and exits from the hot end of the aforesaid accumulator element as a hot medium rinse flow. This hot medium rinse flow is now introduced via the at least one rinse path into the hot end that is in the charged state and that is of the at least one other accumulator element. The hot end of this other accumulator element is the end that a hot medium charging flow acts upon during normal charging. The "hot end" state only exists in the other accumulator element if there has been a corresponding charging. This is why the wording "hot end that is in the charged state" was selected, which thus does not mean that when the hot medium rinse flow is introduced into the (hot) end of the other accumulator element there must be a charged accumulator element, that is, a hot end having a high temperature. Therefore this can also be an uncharged or partly charged other accumulator element, that is, an accumulator element that does not have any temperature profile or that has a corresponding pronounced temperature profile. However, it is preferably provided that the other accumulator element also has a charged or at least partly charged state, that is, that the hot medium rinse flow exiting from the one accumulator element meets the hot end of the other accumulator element. Because of this process, the available temperature layering produced by the charging process remains present in a first accumulator element because the cold end is "cooled" by the cold medium rinse flow and the hot medium rinse flow exiting from the hot end is supplied to the hot end of the other, second accumulator element. Consequently the hot medium rinse flow in the second accumulator element also ensures that its temperature profile, that is, its temperature layering, is maintained, because the hot medium rinse flow cools off while it passes through the other accumulator element so that the other accumulator element has a higher temperature on the input side than on the output side with respect to the flow-through direction of the medium rinse flow. In particular it is provided that this rinsing with the medium rinse flow is repeated during an extended idle period, the cold end of the other, second accumulator element then being acted on by a cold medium rinse flow that exits from the hot end of the second accumulator element and is conducted to the hot end of the one, first accumulator element. These processes can be repeated. In addition, because of this there is a back and forth movement of the energy transported by means of the respective medium rinse flow while the temperature layers of the at least two accumulator elements are maintained. Equalization of the temperatures of the accumulator elements is therefore prevented so that there are reproducible conditions and largely uniform temperatures are available for the charging and discharging, that is, the exit temperature of the charging flow from the cold end of the at least one, first accumulator element is always approximately the same and the removal temperature during discharging of the at least one, first accumulator element is also reproducible so that downstream heat consuming processes can be conducted with optimum efficiency.

[0007] In accordance with one further development of the invention it is provided that the hot ends form upper ends of the accumulator elements and the cold ends form lower ends of the accumulator elements. The accumulator elements consequently have a vertical extension, the medium charging flow that is introduced into the upper ends exiting from the lower ends. The cold medium rinse flow enters into the lower end of at least one accumulator element. The hot medium rinse flow produced thereby exits from the upper end of this accumulator element and is introduced into the upper end of at least one additional accumulator element and exits from the lower end of the latter accumulator element as a cold medium rinse flow.

[0008] In accordance with one further development of the invention it is provided that the rinse path connecting the at least two accumulator element [sic] at their hot ends is embodied as a common connecting chamber arranged above the accumulator elements and extending at least partially across them. In addition, at their hot ends the accumulator elements are communicatingly connected to one another via the common connecting chamber so that the hot medium rinse flow can enter into at least one accumulator element, specifically its hot end, from at least one other accumulator element.

[0009] Furthermore, it is advantageous when at least one first medium opening is disposed above each accumulator element. In particular it is provided that the first medium openings form first heat input openings when the heat exchanger is charging and form first heat output openings when the heat accumulator is discharging. The connecting chamber preferably has the first medium openings. Consequently the medium charging flow can be supplied to the corresponding accumulator element from above via the first medium opening allocated to each accumulator element, the medium charging flow exiting downward from the first medium opening that forms a first heat input opening, passing through the connecting chamber in a largely vertical manner, and meeting the upper end of the aforesaid associated accumulator element. When the heat accumulator is discharging, a cold medium flow is supplied to the lower end of the accumulator element in question. It flows upward through the accumulator element, and in doing so is heated. It exits from the upper, hot end of the accumulator element as a hot medium discharge flow and flows vertically through the connecting chamber and then travels to the first medium opening, which, in this case, forms a first heat output opening, and flows from there via a channel system to a heat utilization location. When rinsing, as already explained, a cold medium rinse flow flows into the cold, lower end of at least one charged accumulator element and exits from the upper, hot end of this accumulator element. Again, the hot medium rinse flow is deflected in the connecting chamber such that it is supplied to the hot end of at least one other accumulator element for instance during the course of a 180° deflection.

[0010] In accordance with one further development of the invention it is provided that a first blocking/cross-section adjustment element is upstream of each of the first medium openings, as seen from the direction of flow of the medium during charging. Furthermore, it is advantageous when the first blocking/cross-section adjustment elements are upstream of the connecting chamber as seen from the direction of flow of the medium during charging. During charging, by closing a first blocking/cross-section adjustment element, no medium charging flow is supplied to this accumulator element or only a very small medium charging flow is supplied via another blocking/cross-section adjustment element and the connecting chamber. Charging or non-charging of the associated accumulator element occurs depending on whether the first blocking/cross-section adjustment elements of corresponding accumulator elements are opened or closed. Consequently the charging process can be controlled or regulated by intentionally supplying the medium charging flow to the desired accumulator elements. During rinsing, a closed blocking/cross-section adjustment element of an accumulator element leads to the hot medium rinse flow exiting from the associated accumulator element not being supplied to an external heat consumer, but rather being deflected via the connecting chamber and being supplied to at least one other accumulator element. Regardless of the type of operation, the degree of blocking or opening of a blocking/cross-section adjustment element always leads to the associated medium flow being adjustable in terms of its volume flow.

[0011] The first blocking/cross-section adjustment elements can preferably be embodied as dampers. The embodiment as dampers represents a robust and simple solution.

[0012] At least one second medium opening is provided beneath each of the accumulator elements.

[0013] During charging of the heat accumulator, the second medium openings form medium return openings for the medium charging flow in the cycle. During discharging of the heat accumulator, the second medium openings form medium supply openings. During charging, the medium charging flow or at least a portion thereof passes through at least one accumulator element and exits from the lower, cold end of the accumulator element and travels to the associated second medium opening. From there the now cold medium charging flow is returned to a heat source in order to be reheated so that it can again be conducted to the heat accumulator as a hot medium charging flow. Consequently there is a medium cycle. Naturally the function of the heat accumulator is also conceivable in an exemplary embodiment in which the cycle is not closed. During discharging a hot medium discharging flow exits from the upper, hot end of the accumulator element in question and is supplied to a heat consumer. The heat consumer cools the medium discharging flow. The latter is then returned to the heat accumulator in that it enters into the lower, cold end of the associated accumulator element through the second medium opening, that is, the medium supply opening, and passes upward through the accumulator element, whereby it is heated and can be supplied again to the heat consumer as a hot medium discharging flow. There is also a medium cycle in this case.

[0014] One further development of the invention provides that the cold end of each at least two accumulator elements is adjacent to an individual chamber, the individual chambers being arranged beneath the accumulator elements. The individual chambers ensure that the medium can flow through the entire cross-section of the respective associated accumulator element. The individual chambers consequently represent medium distribution chambers, both for charging and for discharging operations, as well as for rinsing operations. Each area of the connecting chamber disposed above an accumulator element acts in a similar fashion.

[0015] A second blocking/cross-section adjustment element is preferably upstream of each of the second medium openings as seen in the direction of flow of the medium during discharge. In particular it is provided that the second blocking/cross-section adjustment elements is upstream of the individual chambers as seen in the direction of flow of the medium during discharge.

[0016] In accordance with one further development of the invention, it is provided that the associated medium charging flow or medium discharging flow exits laterally from the individual chambers or enters the individual chambers laterally. Preferably the individual chambers have the second medium openings. These are embodied on the sides of the individual chambers. The individual chambers preferably have walls to which the second blocking/cross-section adjustment elements are allocated. The medium preferably flows laterally into the individual chambers or out of the individual chambers.

[0017] In accordance with one further development of the invention, the accumulator elements are arranged in accumulator chambers of a housing of a heat accumulator. Preferably the accumulator chambers are embodied adjacent to one another and are separated from one another by means of at least one common separating wall. The separating wall is preferably a vertical wall. The individual chambers are also preferably adjacent to one another and are separated from one another by means of a common separating wall.

[0018] Gas, in particular air, is preferably used for the medium.

[0019] The accumulator elements preferably have ceramic material that guarantees high heat accumulating capacity. The accumulator elements in particular constitute individual elements. For instance saddle shapes and/or sphere shapes can be used for fill for individual elements.

[0020] In addition or alternatively the individual elements can preferably be embodied as honeycombs. The honeycombs have medium through-flow channels so that there are very large heat exchange surface areas with low flow losses.

[0021] The invention furthermore relates to a method for storing heat in a heat accumulator that has accumulator elements, in particular in a heat accumulator as described in the foregoing, having the steps: introducing a hot medium into at least one accumulator element for charging and embodying one hot end and one cold end due to temperature layering in the accumulator element, introducing at least one cold medium rinse flow into the cold end of the accumulator element and introducing the hot medium rinse flow exiting therefrom from the hot end of the accumulator element into a hot end, in the charged state, of at least one additional accumulator element.

[0022] It is preferably provided that the introduction of the at least one cold medium rinse flow, as described in the foregoing, is performed multiple times such that heat is transported back and forth between at least two accumulator elements by means of the hot medium rinse flow. The heat is thus transmitted from the one accumulator element to the other accumulator element and then again from the one accumulator element to an accumulator element and so on. This always maintains the temperature layering, that is, the temperature profile of the accumulator element in question.

[0023] Additional advantageous embodiments result from the subordinate claims.

[0024] Further areas of applicability will become apparent from the description provided herein. It should be understood that the description and specific examples are intended for purposes of illustration only and are not intended to limit the scope of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The drawings described herein are for illustration purposes only and are not intended to limit the scope of the present disclosure in any way.

[0026] FIG. **1** depicts a heat accumulator system having a heat accumulator;

[0027] FIG. **2** is a perspective elevation of the heat accumulator from FIG. **1**;

[0028] FIG. **3** depicts the representation from FIG. **2** at a slightly oblique angle and from below;

[0029] FIG. **4** is a block diagram of the heat accumulator system in accordance with FIG. **1**;

[0030] FIG. **5** is a perspective elevation of another exemplary embodiment of a heat accumulator;

[0031] FIGS. **6** through **8** are two side views and a top view of the heat exchanger in accordance with FIG. **5**.

DETAILED DESCRIPTION

[0032] The following description is merely exemplary in nature and is not intended to limit the present disclosure, application, or uses. It should be understood that throughout the drawings, corresponding reference numerals indicate like or corresponding parts and features.

[0033] FIG. **1** depicts a heat accumulator system **1** that has a heat accumulator **2**. In the exemplary embodiment described, the heat accumulator **2** is consequently operated by means of a heat source **5**. However, the heat accumulator **2** can also be used in conjunction with a plurality of heat energy sources, which heat energy sources also may be different from one another, without departing from the subject-matter of the invention.

[0034] In the exemplary embodiment in FIG. **1**, the heat source **5** is attached to a medium cycle, air being used as the medium. Disposed in the medium cycle **6** are two fans **7** and **8**, at least one fan **7** or **8** transporting air to the heat source **5** via a line **9** while heat is added using the heat source **5**. The air is very intensely heated in the heat source **5** and the heated air is supplied to a branch **11** via a lien **10**. A line **12** that is attached to a heat absorber **13** goes out from the branch **11**. The hot air preferably has a temperature of several hundred degrees Celsius at in particular 1 bar. The air leaving the heat absorber **13**, which is cooled and has a pressure of preferably 1 bar, is again supplied to the heat source **5** by means of the fan **8** and/or **7**. Disposed between the two fans **7** and **8** is a branch **19** from which an accumulator line **20** runs that leads to the heat accumulator **2**. Furthermore branching from the branch **11** is an accumulator line **21** that also leads to the heat accumulator **2**. The accumulator line **20** leads to the "cold end" **22** and the accumulator line **21** leads to the "hot end" **23** of the heat accumulator **2**. The significance of these terms shall be explained in greater detail in the following.

[0035] While heat is being added to the heat source **5**, required heat energy cannot be supplied to the heat accumulator **2** from the heat absorber **13** by means of the accumulator line **21**, that is, a corresponding hot air flow is supplied to the hot end **23** of the heat accumulator **2** via the accumulator line **21**. The hot air flow that heats the heat accumulator **2** cools as it passes through the heat accumulator **2** from for instance approximately 700° C. (the temperature ranges in particular from 300° C. to 1000° C.) to for instance 150° C. (the temperature ranges in particular from 50° C. to 250° C.) and leaves the cold end **22** of the heat accumulator **2** via the accumulator line **20**. Then the air passing through the heat accumulator **2** is resupplied to the heat source **5**. Naturally it is also possible to supply all of the energy from the heat source **5** only to the heat accumulator **2** if for instance the heat absorber **13** is not active for certain operational reasons.

[0036] The heat accumulator **2** is discharged during periods when no heat energy or insufficient heat energy is delivered by the heat source **5**. In such a case the fan **7** is turned off and the heat source **5** is separated from the cycle by closing two valves **24**. The fan **8** is active and supplies air to the cold end **22** of the heat accumulator **2** via the accumulator line **20**. The air passes through the heat accumulator **2** and heats up for instance preferably to approximately 700° C. and leaves the heat accumulator **2** via the accumulator line **21**. The hot air then flows via the line **12** to the heat absorber **13** (for instance heat exchanger) and from there back to the fan **8**. It is clear from this that the heat absorber **13** can also be operated during periods in which no heat energy or insufficient heat energy is delivered by the heat source **5**.

[0037] FIGS. **2** and **3** illustrate the structure of the heat accumulator **2** using an exemplary embodiment. The heat accumulator **2** has a housing **25** that is divided into a plurality of accumulator chambers **26** through **29**. Four accumulator chamber **26** through **29** are provided in the exemplary embodiment depicted. Disposed in each accumulator chamber **26** through **29** is an accumulator element **30** through **33** that is able to accumulate store energy. The accumulator elements **30** through **33** preferably comprise ceramic material, for instance ceramic honeycombs, that is, the accumulator elements **30** through **33** are made up of individual elements. The accumulator chambers **26** through **29** are arranged adjacent to one another and are separated from one another by means of separating walls **34** through **37**.

[0038] Embodied in the housing **25** above the accumulator chambers **26** through **29** is a common connecting chamber **38** that creates a connection for the medium, in particular the aforesaid air, among the accumulator elements **30** through **33**.

[0039] A first medium opening **39** through **42** is disposed above each accumulator element **30** through **33**, the first medium openings **39** through **42** being embodied in a cover **43** for the connecting chamber **38**.

[0040] In accordance with FIG. **2**, the accumulator line **21** divides into four individual lines **44** through **47**, first blocking/cross-section adjustment elements **48** through **51** being arranged in the individual lines **44** through **47**. The first blocking/cross-section adjustment elements **48** through **51** are embodied as dampers, in particular double baffles. The individual lines **44** through **47** are attached to the first medium openings **39** through **42**, respectively.

[0041] Individual chambers **52** through **55** are disposed beneath each accumulator element **30** through **33** or beneath the accumulator chambers **26** through **29**, whereby in terms of flow engineering there is a connection between each corresponding accumulator chamber **26** through **29** and the individual chamber **52** through **55** disposed therebeneath. The individual chambers **52** through **55** are adjacent to one another and are separated from one another by means of common separating walls **56** through **59**. A deflection chamber **60** through **63** is allocated to each individual **52** through **55**, the deflection chambers **60** through **63** being disposed laterally on the housing **25**, each in the area of its associated individual chamber **52** through **55**. Each individual chamber **52** through **55** is connected to an associated deflection chamber **60** through **63** via a second medium opening **64** through **67**. The deflection chambers **60** through **63** have floors **68** through **71** that are provided with second blocking/cross-section adjustment elements **72** through **75**. The second blocking/cross-section adjustment elements **72** through **75** are preferably embodied as disk valves. The accumulator line **20** (not shown in FIGS. **2** and **3**) is attached to the second blocking/cross-section adjustment elements **72** through **75**.

[0042] Furthermore, arranged laterally on the housing **25** are deflection chambers **76** through **79**, each of which is connected to its associated individual chamber **52** through **55** in terms of flow engineering. The individual chambers **52** through **55** are each connected via medium rinse openings **80** through **83** to respective associated deflection chambers **76** through **79**. The deflection chambers **76** through **79** have floors **84** through **87** that are provided with third blocking/cross-section adjustment elements **88** through **91** and attached to a medium rinse line **92** (FIG. **4**) that is not shown in FIGS. **2** and **3**. The third blocking/cross-section adjustment elements **88** through **91** are preferably embodied as disk valves.

[0043] FIG. **4** uses a block diagram to illustrate the heat accumulator **1**. The heat source **5** and the heat absorber **13** are drawn in broken lines as boxes. In addition to the valves **24**, further valve **93** are provided that cannot be seen in FIG. **1** and that are allocated to the heat absorber **13**. Compared to the depiction in FIG. **1**, the valve **24** allocated to the fan **7** is arranged downstream of the fan **7**, rather than upstream thereof, but this does not represent a difference in terms of function. It can be seen from FIG. **4** that the medium rinse line **92** is fed by a medium rinse fan **94** that can supply ambient air to the third blocking/cross-section adjustment elements **88** through **91** via an air filter **95**.

[0044] The following function occurs: First, it is assumed that heat energy

[0045] available, that is, the heat source **5** delivers heat energy for heating up the air that forms the medium and that is caused to circulate in the cycle by means of the fan **7** and/or the fan **8**. The hot air is preferably 700° C. and preferably is at 1 bar pressure. It is returned via the line **10**, the open valve **24**, the line **12**, and the open valve **93** to the heat absorber **13** and from there via the fan **8**, the open valve **93**, the fan **7**, the open valve **24**, and the line **9** back to the heat source **5**. However, it is also possible to release the air directly into the environment via the fan **7**. After the hot air has left the heat absorber **13** it is preferably still 150° C. at a pressure of 1 bar.

[0046] If the heat absorber **13** does not require all of the heat energy, some of the hot air is deflected at the branch **12** and supplied via the accumulator line **2** to at least one of the accumulator elements **30** through **33**. The accumulator element **30** through **33** or accumulator elements **30** through **33** is/are selected by opening or partly opening the first blocking/cross-section adjustment elements **48** through **51**. For instance, if all of the first blocking/cross-section adjustment elements **48** through **51** are opened, a corresponding partial hot air flow is supplied via the common connecting chamber **38** to each of the accumulator elements **30** through **33**. Because the hot air flows through the accumulator elements **30** through **33**, the latter are heated up and a temperature profile is created. The result is that they form a hot end **23** in the upper area and a cold end **22** in the lower area. There is consequently a temperature profile across the length of the respective accumulator element **30** through **33**, the hot end having a temperature of preferably approximately 700°, and the cold end having a temperature of approximately 150° C., each at 1 bar. This temperature profile can also be called temperature layering of the respective accumulator element **30** through **33**. The hot air flowing through each accumulator element **30** through **33** leaves the heat accumulator **2** via the respective associated individual chambers **52** through **55** and the corresponding opened second blocking/cross-section adjustment element **72** through **75** and travels via a common valve **96** in the accumulator line **20** and via the branch **19** back to the collector **5**, in order to be reheated there.

[0047] From the foregoing it is clear that by intentionally opening or partly opening or blocking the blocking/cross-section adjustment elements **48** through **51** and **72** through **75** it is possible to charge [the heat accumulator] with a corresponding quantity of heat. It is also possible just to charge the heat accumulator **2** and not to operate the heat absorber **13**. For this it is merely necessary to close the valves **93**.

[0048] In the following it is assumed that the valves **24** are closed for discharging the heat accumulator **2** so that the heat energy is delivered only by the heat accumulator **2**. This operation can occur for instance when no energy is available, that is, the heat generator **5** is not providing any heat energy. For this, the fan **8** is operated so that a corresponding air flow is supplied via the line **20** and the valve **96** and the second blocking/cross-section adjustment elements **72** through **75** and the respective individual chambers **52** through **55** to the cold ends **22** of the accumulator elements **30** through **33**. Naturally it is possible to select from the number of available accumulator elements **30** through **33** only the element or those elements that are desired. They can be selected by closing or opening the corresponding second blocking/cross-section adjustment elements **72** through **75**. Due to the medium flow flowing through the hot accumulator elements **30** through **33**, the latter heat up according to the temperature profile in each accumulator element **30** through **33** so that hot air leaves each accumulator element **30** through **33** at a temperature of for instance 700° and travels through the common connecting chamber **38** and the opened first blocking/cross-section adjustment elements **48** through **51**, the accumulator line **21**, and the line **12** to the heat absorber **13**. Then the air that has been cooled to approximately 150° C. because it has passed through the heat absorber **13** is available to pass through the cycle again.

[0049] Moreover, a mixed mode operation for charging and discharging the heat accumulator **2** is also possible. Heat energy can be provided to the absorber and collected in the heat accumulator **2** in parallel. It is also possible to provide heat energy to the absorber and remove it from the heat accumulator **2** in parallel.

[0050] It is particularly significant that, in accordance with the following process, the temperature layering is not equalized during an idle period for the heat accumulator **2** that is when heat energy is neither supplied thereto nor removed therefrom. If left alone, the temperature layering within the accumulator elements **30** through **33** would slowly even out so that there is no longer a temperature gradient (in this exemplary instance 700° C. at the hot end **23** and 150° C. at the cold end **22**). However, the consequence of this would be that the accumulator would no longer be fully utilizable in terms of capacity, which would substantially reduce the efficiency of the entire system. However, due to the option of rinsing with a medium rinse device **98** it is provided that the desired temperature layering can be maintained while the heat accumulator **2** is idle. For this, ambient air is suctioned by means of the medium rinse fan **94** via the air filter **96** and, with only a very low volume flow, that is a low throughput, is supplied for instance via the opened third blocking/cross-section adjustment element **91** and the associated individual chamber **55** to the cold end **22** of the accumulator element **33**. This air passes through the accumulator element **33** from below to above and in doing so heats up in the lower area for instance to approximately 150° C. and in the upper area, that is at the hot end **23**, for example to 700° C. The air then enters the connecting chamber **38** at the upper end **23** and is supplied from there for instance to the accumulator element **31**. The connecting chamber **38** consequently forms a rinse path **99**. This occurs in that the first blocking/cross-section adjustment elements **48** through **51** are closed and the second blocking/cross-section adjustment elements **72**, **74**, **75** are also in the closed position. The third blocking/cross-section adjustment elements **88**, **89**, **90** are also closed. Only the second blocking/cross-section adjustment element **73** is in the open position, so that the hot air that has been heated to approximately 700° C. enters into the hot end **23** of the accumulator element **31** from the connecting chamber **38** and passes through the accumulator element **31** from above to below so that the air exits from the cold end **22** at approximately 150° C. It is then conducted out into the environment via the second blocking/cross-section adjustment element **73** and a discharge valve **97** that is attached to the accumulator line **20** and is disposed upstream of the preferably closed valve **96**. This energy loss is only minor because the volume flow is not large. After a certain period of time the aforesaid process can be reversed, that is, the corresponding valves and elements are switched such that the medium rinse fan **94** now supplies the cold end **22** of the accumulator element **31** and the hot air entering therethrough into connecting chamber **38** is supplied to the hot end **23** of the accumulator element **33**. From all of this it is clear that, by appropriately switching the valves and elements, other accumulator elements **30** through **33** and other combinations of accumulator elements **30** through **33** can also be provided with rinse air, so that each temperature profile of the individual accumulator elements **30** through **33** is maintained. Consequently the temperature layering is not destroyed, but rather due to this rinse process or these rinse processes is maintained in each accumulator element **30** through **33**, even when the heat accumulator **2** is idle.

[0051] By operating the heat accumulator appropriately, it is possible to adapt to corresponding energy flows during charging and discharging, in particular also during partial load operation, so that the heat energy is stored in a controlled manner and there are no local increases in temperature that are not desired. Furthermore, equalization in the temperature profile in the accumulator elements is prevented. If there is an undesired equalization in the temperature layering, the output temperature increases when the accumulator is charged and decreases when it is discharged. Such an accumulator can thus be used in an only partial manner and must be completely emptied or shut down for full charging or discharging. The invention avoids this. With the invention, it is always possible for the hot side or the hot ends of the accumulator elements to be acted upon by the charging flow and the cold side or the cold ends to be acted upon by the discharging flows. For stabilizing and maintaining the temperature distribution in the individual layers of the accumulator elements, rinsing is performed from the cold side, that is from the cold end, using rinse air that is distributed on the hot side, that is on the hot end, to at least one other accumulator element or to different other accumulator elements. Of course it is also possible to supply to a plurality of accumulator elements simultaneously with the rinse medium flow that, after it is heated, is conducted to at least one other accumulator element. The objective is to store the maximum quantity of energy at a charge that is as high as possible.

[0052] Drawings **5** through **8** depict another exemplary embodiment of a heat accumulator **2**, the structure of which however largely corresponds to that of the exemplary embodiment described in the foregoing. FIGS. **5** through **8** illustrate an exemplary embodiment in which, compared to FIG. **4**, no first blocking/cross-section adjustment elements **48** through **51** are provided. Thus the accumulator line **21** runs directly into the connecting chamber **38**, dividing first in order to be able to supply the air to the accumulator elements **30** through **33** as uniformly as possible. For activating or deactivating each of the accumulator elements **30** through **33**, the blocking/cross-section adjustment elements **88** through **91** and/or **72** through **75** are actuated appropriately. The common accumulator line **20** can be seen clearly in FIGS. **5** through **8** (it is not shown in the exemplary embodiment in FIGS. **2** and **3**). For the sake of clarity, the connection of the medium rinse line **92** (FIG. **4**) to the third blocking/cross-section adjustment elements **88** through **91** is not shown in FIGS. **5** through **8**. Otherwise the statements regarding FIGS. **1** through **4** also apply correspondingly to the exemplary embodiment in FIGS. **5** through **8**.

What is claimed is:

1. A heat accumulator having a heat accumulator structure that has at least two accumulator elements through which a medium flows for charging and that thus each forms a hot end and a cold end by temperature layering and having a medium rinse device that in a rinse operation for said heat accumulator produces at least one cold medium rinse flow and introduces it into said cold end of at least one of said accumulator elements, the hot medium rinse flow exiting from said hot end of said accumulator element entering via at least one rinse path said hot end that is in the charged state and that is of said at least one other accumulator element.

2. The heat accumulator of claim **1**, wherein said hot ends form upper ends of said accumulator elements and said cold ends form lower ends of said accumulator elements.

3. The heat accumulator of claim **1**, wherein said rinse path connects said at least two accumulator elements at their hot ends and is embodied as a common connecting chamber arranged above said accumulator elements and extends at least partially across them.

4. The heat accumulator of claim **1**, wherein at least one first medium opening is disposed above said or above each of said accumulator elements.

5. The heat accumulator of claim **4**, wherein said first medium openings form first heat input openings when said heat exchanger is charging and form first heat output openings when said heat accumulator is discharging.

6. The heat accumulator of claim **4**, wherein said connecting chamber has said first medium openings.

7. The heat accumulator of claim **4**, wherein a first blocking/cross-section adjustment element is upstream of each of said first medium openings as seen from the direction of flow of the medium during charging.

8. The heat accumulator of claim **7**, wherein said rinse path connects said at least two accumulator elements at their hot ends and is embodied as a common connecting chamber arranged above said accumulator elements and extends at least partially across them; and further wherein said first blocking/cross-section adjustment elements are upstream of said connecting chamber as seen from the direction of flow of the medium during charging.

9. The heat accumulator of claim **7**, wherein said first blocking/cross-section adjustment elements are embodied as first dampers or first disk valves.

10. The heat accumulator of claim **4**, wherein at least one second medium opening is disposed beneath each of said accumulator elements.

11. The heat accumulator of claim **10**, wherein during charging of said heat accumulator, said second medium openings form medium return openings for the charging medium flow and during discharging form medium supply openings for the discharging medium flow.

12. The heat accumulator of claim **11**, wherein said cold end of each of said at least two accumulator elements is adjacent to an individual chamber, the individual chambers being arranged beneath said accumulator elements.

13. The heat accumulator of claim **11**, wherein a second blocking/cross-section adjustment element is upstream of each of said second medium openings as seen in the direction of flow of the medium during discharge.

14. The heat accumulator of claim **12**, wherein said second blocking/cross-section adjustment elements is upstream of said individual chambers as seen in the direction of flow of the medium during discharge.

15. The heat accumulator of claim **12**, wherein said associated medium charging flow or medium discharging flow exits laterally from said individual chambers or enters said individual chambers laterally.

16. The heat accumulator of claim **12**, wherein said individual chambers have said second medium openings.

17. The heat accumulator of claim **13**, wherein said second blocking/cross-section adjustment elements are embodied as second dampers or second disk valves.

18. The heat accumulator of claim **12**, wherein at least one medium rinse opening is disposed beneath said or each of said accumulator elements.

19. The heat accumulator of claim **18**, wherein a third blocking/cross-section adjustment element is upstream of each of said second medium rinse openings as seen in the direction of flow of a medium rinse flow.

20. The heat accumulator of claim **19**, wherein said third blocking/cross-section adjustment elements are upstream of said individual chambers as seen in the direction of flow of said medium rinse flow.

21. The heat accumulator of claim **19**, wherein said associated medium rinse flow enters the individual chambers laterally.

22. The heat accumulator of claim **18**, wherein said individual chambers have said medium rinse openings.

23. The heat accumulator of claim **19**, wherein said third blocking/cross-section adjustment elements are embodied as third dampers or third disk valves.

24. The heat accumulator of claim **1**, wherein said accumulator elements are arranged in accumulator chambers of a housing of said heat accumulator.

25. The heat accumulator of claim **24**, wherein said accumulator chambers are disposed adjacent to one another and are separated from one another by means of at least one common separating wall.

26. The heat accumulator of claim **12**, wherein said individual chambers are disposed adjacent to one another and are separated from one another by means of at least one common separating wall.

27. The heat accumulator of claim **1**, wherein the medium is gas, in particular air.

28. The heat accumulator of claim **1**, wherein said accumulator elements comprise ceramic material.

29. The heat accumulator of claim **1**, wherein said accumulator elements constitute individual elements.

30. The heat accumulator of claim **29**, wherein said individual elements are honeycombs.

31. A method for storing heat in a heat accumulator that has accumulator elements comprising:

introducing a hot medium into at least one accumulator element for charging and embodying one hot end and one cold end due to temperature layering in said accumulator element; and

introducing at least one cold medium rinse flow into the cold end of said accumulator element and introducing the hot medium rinse flow exiting therefrom from said hot end of said accumulator element into a hot end, in the charged state, of at least one additional accumulator element.

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