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(54) Heat storing fireplace

(57) Heat storing fireplace comprising a firebox (2) provided with a grate (1) and a combustion space (3) above it, side channels (4,6) on both sides of the firebox and combustion space, leading to a chimney flue, heat storing material (5) placed above the combustion space, throat apertures (11,12) opening from the combustion space below the heat storing material for passing the combustion gases into the side channels, and a circulation channel (7) disposed around the heat storing material for passing hot gases around it. The circulation channel (7) forms a combustion gas channel surrounding the heat storing material (5) by its sides and top. In addition, the fireplace is provided with at least one flow controller (8, 9, 10) for directing the combustion gases asymmetrically into the side channels (4,6) so as to produce a circulating flow in a certain direction in the circulation channel (7).

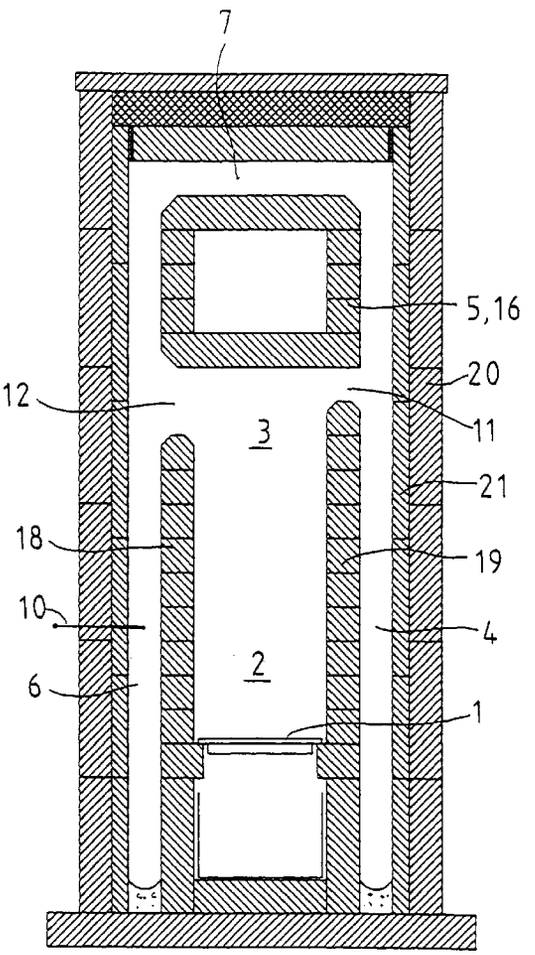

Fig 1

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Description

[0001] The present invention relates to a heat storing fireplace as defined in the preamble of claim 1.

[0002] Especially fireplaces with a baking oven but also other heat storing fireplaces comprise heat storing material above the firebox, around which the hot combustion gases must circulate along a route long enough to allow the heat to be effectively transferred into the storage fireplace.

[0003] Traditionally, in certain fireplaces with a baking oven, in which no fuel is not burned in the baking oven and no combustion gases are passed through it, this has been implemented in such manner that the combustion gases flow up from the upper part of a combustion space via a route passing behind the baking oven to a space above it and further downward along the sides or flanks of the baking space e.g. through the side channels of the fireplace into a chimney flue. This is a functional and effective solution in respect of heat storage and combustion efficiency. With this structure, a high baking temperature requires a relatively large amount of fuel wood. At the same time, a high heating efficiency is achieved, which is an advantage when effective heating is desired. A massive structure is not a disadvantage when the heating energy can be effectively utilised.

[0004] A feature characteristic of prior-art solutions is a massive fireplace structure and above all a relatively large depth dimension, which is mainly due to the fact that the heat storing material and the riser channel for combustion gases behind it together require a large space. In many cases, there is only a limited space reserved for a fireplace in a building or the fireplace must be placed in a smaller room where no high heating efficiency is needed but good baking properties are still desired.

[0005] The object of the present invention is to disclose a new type of heat storing fireplace which has smaller dimensions and weight than corresponding prior-art heat storing fireplaces and which still has characteristics substantially corresponding to prior-art solutions although the baking space can be heated with a substantially smaller amount of fuel wood than in prior-art fireplaces with a baking oven.

[0006] As for the features characteristic of the invention, reference is made to the claims.

[0007] The heat storing fireplace of the invention comprises a firebox provided with a grate and a combustion space above it. Placed on both sides of the firebox and combustion space are side channels leading to a chimney flue. In addition, placed above the combustion space is heat storing material, and below the heat storing material there are throat apertures which pass the combustion gases into the side channels. Furthermore, the fireplace has a circulation channel surrounding the heat storing material for appropriately passing hot combustion gases around the heat storing material and further on. According to the invention, the circulation channel forms a combustion gas channel surrounding the heat storing material by its top and sides, the fireplace being additionally provided with at least one flow controller designed to direct combustion gases asymmetrically into the side channels so as to produce a circulating flow in a certain direction in the circulation channel surrounding the heat storing material.

[0008] Thus, an essential feature of the heat storing fireplace of the invention is that it does not require any smoke channel behind the heat storing material which would increase the depth dimension of the fireplace, but the channels surround the heat storing material only along its sides and top.

[0009] The fireplace may be provided with one or more flow controllers placed in different parts of the fireplace, by means of which the hot gases can be caused to circulate in a desired direction around the heat storing material. The essential point is that, using flow controllers, appropriately asymmetric combustion gas currents are formed in the side channels so that the desired circulation flow is realised. 'Asymmetric' here means that the combustion gas currents flowing in the two side channels differ from each other in respect of flow rate, length of flow route and/or temperature.

[0010] In an embodiment, the flow controller used is a fixed blockage that completely closes one of the throat apertures. Thus, the combustion gases always pass through only one throat aperture, from where a portion of the gas flow passes directly from the throat aperture to a side channel while another portion of it circulates around the heat storing material into the other side channel.

[0011] In a second embodiment of the invention, the flow controller consists of a regulating element disposed in the throat aperture, permitting adjustment of the cross-sectional area of the throat aperture. Such a regulating element may be placed only in the throat aperture or it may be a swing damper or equivalent suitably placed between the throat aperture and the corresponding side channel so that opening the throat aperture closes the side channel and, correspondingly, closing the throat aperture opens the side channel. In a third embodiment of the invention, the flow controller consists of fixed, i.e. non-adjustable throat apertures differing from each other in respect of flow resistance, e.g. throat apertures differing in cross-sectional area.

[0012] In a fourth embodiment of the invention, the flow controller is a regulating element disposed e.g. in only one of the side channels to allow adjustment of gas flow in this side channel. The side channels can also be so implemented that they are permanently different in respect of flow resistance, which also results in the desired circulation flow around the heat storing material. It is even possible that, if the flue junction common to both channels at the lower end of the side channels is disposed in an appropriately asymmetric manner, side channel flow routes of different lengths are created which therefore have a sufficient difference between

them in respect of flow properties to produce a circulation flow around the heat storing material.

[0013] The heat storing material placed above the firebox and the combustion space above it may consist of various components depending on the functions desired in each case. If only a fireplace having a good heat storing capability but as small a height dimension as possible is desired, then the heat storing material may consist of e.g. a relatively thin soapstone slab. The heat storing material used may also consist of a heat exchanger made of soapstone or a suitable metal, allowing e.g. a suitable air or liquid circulation to be arranged inside it.

[0014] In an embodiment of the invention, the heat storing material consists of a baking oven provided with a door that opens to the outside of the fireplace while the combustion gases circulate only outside the baking oven. The envelope of the baking oven, i.e. the heat storing material, is preferably made of soapstone, but other materials, such as metals, may also be used. It is also possible use a structure in which the door opening to the outside of the fireplace is disposed in the space between the heat storing material and the firebox so that a baking oven is formed by the downward open upper part of the firebox.

[0015] The door of the baking oven may be arranged to open in the same direction with the firebox door or to the opposite side. The doors may also be placed at an angle of 45°, 90° or 135° relative to each other, in which case, in addition to the vertical side channels, horizontal channel portions can be used to shift the position of the vertical channels laterally to a suitable position so as to pass the combustion gases into the flue.

[0016] As compared with prior art, the fireplace of the invention provides above all the advantage of a light construction while still having good heating properties. As the fireplace does not need any ascending or descending smoke flues behind the heat storing material, it can made to a considerably smaller depth dimension than corresponding prior-art fireplaces. This considerably reduces the floor area required by the fireplace, as well as the total weight of the fireplace and the number of parts required, and therefore also the purchase price and erection costs.

[0017] The structure can also be implemented in existing fireplaces as a retrofit, especially in soapstone fireplaces, but also in fireplaces made of other materials, because the fireplace structures have congruent lower parts, allowing the upper part to be optimised in accordance with the intended use.

[0018] In the following, the invention will be described in detail by referring to the attached drawings, wherein

Fig. 1 presents a heat storing fireplace according to the invention,

Fig. 2 presents a second embodiment of the invention,

Fig. 3 presents a third embodiment of the invention,

Fig. 4 presents a fourth embodiment of the invention, and

Fig. 5 presents the embodiment in Fig. 4 in lateral section.

[0019] A heat storing fireplace as presented in a sectional view in Fig. 1 comprises a firebox 2 provided with a grate 1 and a combustion space 3 above it. These are limited in the lateral direction by massive partitions 18 and 19 made of soapstone. Placed above the combustion space 3 is a baking oven 16 acting as heat storing material 5, with a door that opens in a forward direction, in the same direction with the door of the firebox 2. The door may also open to the back or side of the fireplace.

[0020] The fireplace has an envelope 20 made of soapstone. The inner side of the envelope may be provided with an additional stone layer 21, which may consist of soapstone or a suitable fire resistant material having a lower heat conductivity than soapstone, to keep the baking oven warm for a longer time.

[0021] Thus, side channels 4 and 6 are formed between the envelope 20 and the partitions 18 and 19, and a circulation channel 7 surrounding the baking oven only on its sides and top is formed between the baking oven 16 and the envelope 20. The combustion space 3 opens into the upper end of the side channels 4 and 6 through the throat apertures 11 and 12 between the partitions 16 and 19 and the baking oven 16.

[0022] In this embodiment, the flow controller of the invention is partly implemented by making the first throat aperture 11 above partition 19 considerably smaller in cross-sectional flow area than the second throat aperture 12 above partition 18. Therefore, considerably larger amounts of combustion gas can flow out of the combustion space 3 via the second throat aperture 12. An additional flow controller used in this embodiment is a regulating element 10 placed in side channel 6 below the second throat aperture 12, allowing the gas flow into this channel to be throttled. In this way, hot combustion gases can be caused to flow around the baking oven 16 along the circulation channel 7 so that the baking oven 16 is uniformly heated from all sides.

[0023] Fig. 2 presents a sectional view of a second embodiment of the invention, which comprises substantially the same basic parts as the fireplace in Fig. 1. These are also indicated by the same reference numbers. In this embodiment, the heat storing material 5 is only a massive soapstone slab 15 used to increase the heat storing capacity of the fireplace. Moreover, in this embodiment the throat aperture between the second partition 19 and the heat storing material 15 is closed with a fixed blockage 8, so the combustion gases can only flow out of the combustion space 3 through the throat aperture 12 on the other side. Thus, a portion of the combustion gases flows directly down via the side channel 6 on that side while another portions of the gases is passed as a circulating flow via the circulation channel 7 into the other side channel 4.

[0024] Fig. 3 presents a third embodiment of the invention, in which the basic structure and numbering are the same as in the embodiments in Fig. 1 and 2. The heat storing material 5 used in this embodiment is a heat exchanger 17, which allows heat to be transferred from the fireplace to a desired place by using a suitable liquid circulation system. This embodiment uses two flow controllers, one of which is a turnable regulating element 9 or swing damper placed at the upper end of partition 19 in the throat aperture 11 between the partition and the heat exchanger 17. The regulating element 9 is so hinged on the upper end of the partition 19 that, in one of its limit positions, it closes the throat aperture 11 substantially completely while the adjacent side channel 4 remains fully open. In the other limit position, the regulating element 9 opens the throat aperture 11 practically completely and closes the side channel 4. Thus, by setting the regulating element 9 in suitable intermediate positions, it is possible to regulate the gas flow in the throat aperture 11 and in the side channel 4.

[0025] The fireplace has a throat aperture 12 of constant cross-section at the upper end of the second partition 18. The second side channel 6 extending downward from it is provided with a fixed throttle 22 formed by a thicker portion of partition 18 which protrudes into the side channel 6, thus reducing the cross-sectional flow area of the side channel and diminishing the downward flow of combustion gases in the side channel 6. The cross-sectional flow area of the side channel 6 can also be throttled by using a thicker double stone structure 21 adjoining the envelope stone layer 20. Thus, by suitably placing the regulating element 9, a substantial portion of the combustion gases can be circulated via the circulation channel 7 around the heat exchanger 17 so that heat is effectively transferred to the heat exchanger.

[0026] Fig. 4 presents a cross-sectional view of a fourth embodiment of the invention, comprising substantially the same basic parts as the previous figures, indicated by the same reference numbers. The heat storing material used in this embodiment consists of the baking oven 16. Moreover, in this embodiment the throat aperture between partition 19 and the baking oven 16 is closed with a fixed blockage 8, so the combustion gases can only flow out of the combustion space 3 through the throat aperture 12 on the other side, part of the combustion gases flowing directly down via the side channel 6 on that side while part of the gases is passed as a circulating flow via the circulation channel 7 into the other side channel 4.

[0027] Fig. 5 presents the embodiment in Fig. 4 in lateral section. As shown in the figure, the circulation channel of the invention is disposed at the sides and on top of the heat storing material 5, passing a circulating flow only by the sides and top of the heat storing material, thus making it unnecessary to provide smoke flues behind the baking oven 16. Therefore, a relatively small depth dimension of the structure as a whole and a small floor area required by the fireplace are achieved.

[0028] In the foregoing, the invention has been described by way of example by the aid of the attached drawings, but different embodiments of the invention are possible within the scope of the inventive idea defined by the claims.

Claims

1. Heat storing fireplace, comprising

   - a firebox (2) provided with a grate (1) and a combustion space (3) above it,
   - on both sides of the firebox and combustion space, side channels (4,6) leading to a chimney flue,
   - heat storing material (5) placed above the combustion space,
   - throat apertures (11,12) opening from the combustion space below the heat storing material for passing the combustion gases into the side channels, and
   - a circulation channel (7) disposed around the heat storing material for passing hot gases around it,

   characterised in that the circulation channel (7) forms a combustion gas channel surrounding the heat storing material (5) by its sides and top and that the fireplace is provided with at least one flow controller (8, 9, 10) for directing the combustion gases asymmetrically into the side channels (4,6) so as to produce a circulating flow in a certain direction in the circulation channel (7).

2. Fireplace as defined in claim 1, **characterised** in that the flow controller is a fixed blockage (8) that completely closes one (11) of the throat apertures.

3. Fireplace as defined in claim 1, **characterised** in that the flow controller is a regulating element (9) which closes a throat aperture (11) in a manner permitting the aperture to be adjusted and opened.

4. Fireplace as defined in claim 1, **characterised** in that the flow controller consists of throat apertures (11,12) differing from each other in respect of flow resistance.

5. Fireplace as defined in claim 1, **characterised** in that the flow controller consists of a regulating element (10) disposed in a side channel.

6. Fireplace as defined in claim 1, **characterised** in that the flow controller consists of side channels (4,6) differing from each other in respect of flow resistance.

7. Fireplace as defined in any one of claims 1 - 6, **characterised** in that the heat storing material (5) consists of a continuous mass of soapstone (15).

8. Fireplace as defined in any one of claims 1 - 6, **characterised** in that the heat storing material (5) consists of a baking oven (16) provided with a door that opens to the outside of the fireplace.

9. Fireplace as defined in any one of claims 1 - 6, **characterised** in that the heat storing material (5) consists of a heat exchanger (17).

10. Fireplace as defined in any one of claims 1 - 6, **characterised** in that it has an outward-opening door in the space between the heat storing material (5) and the firebox.

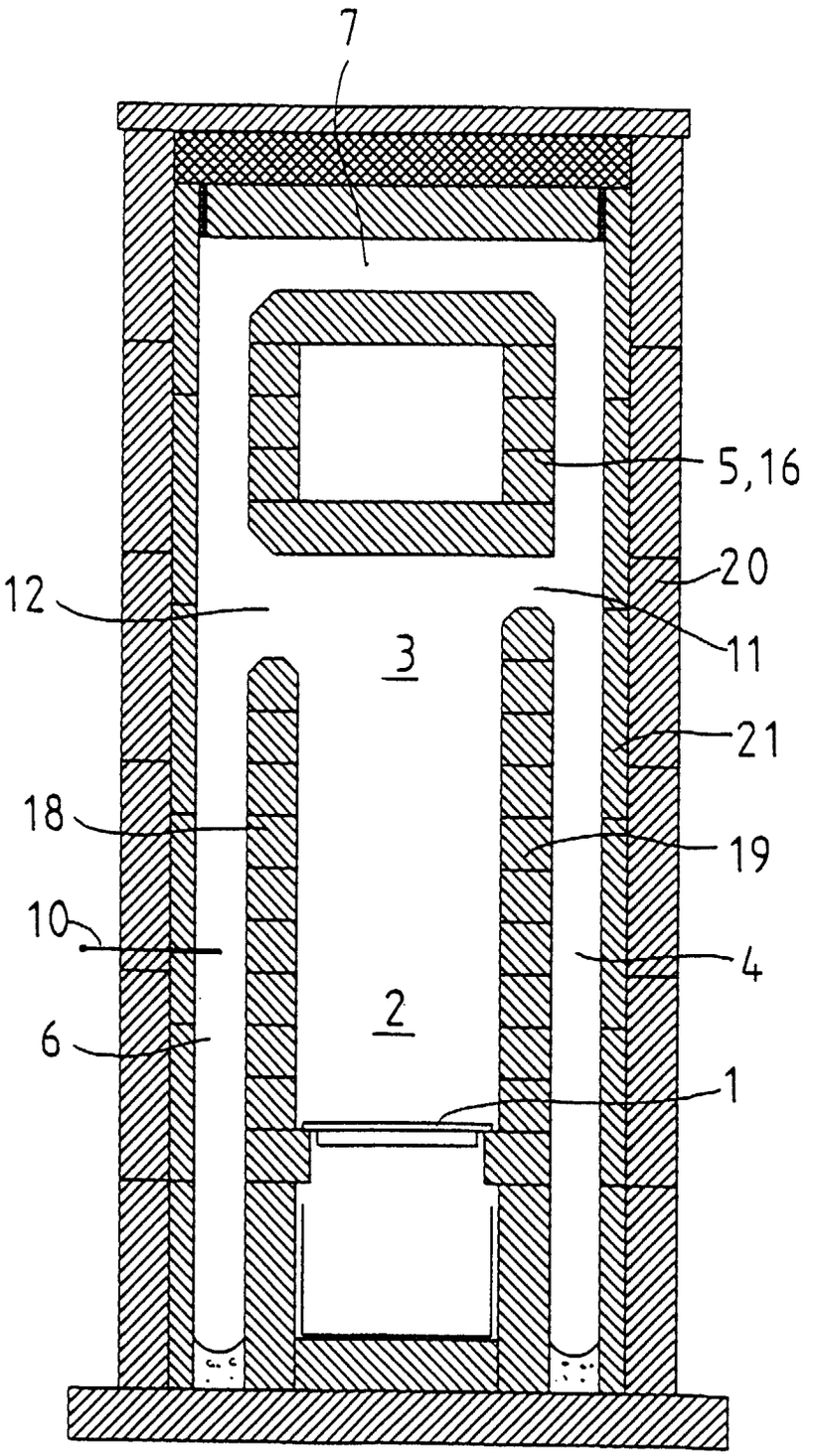

Fig 1

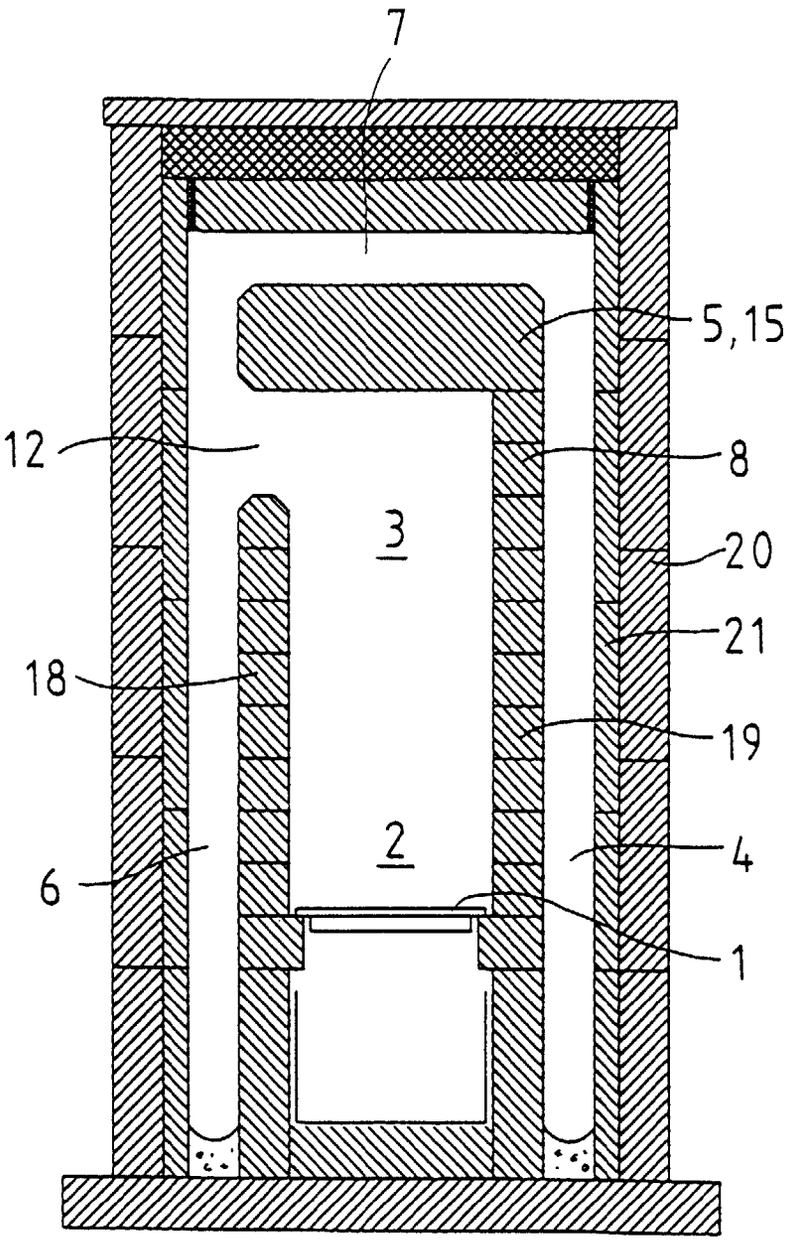

Fig 2

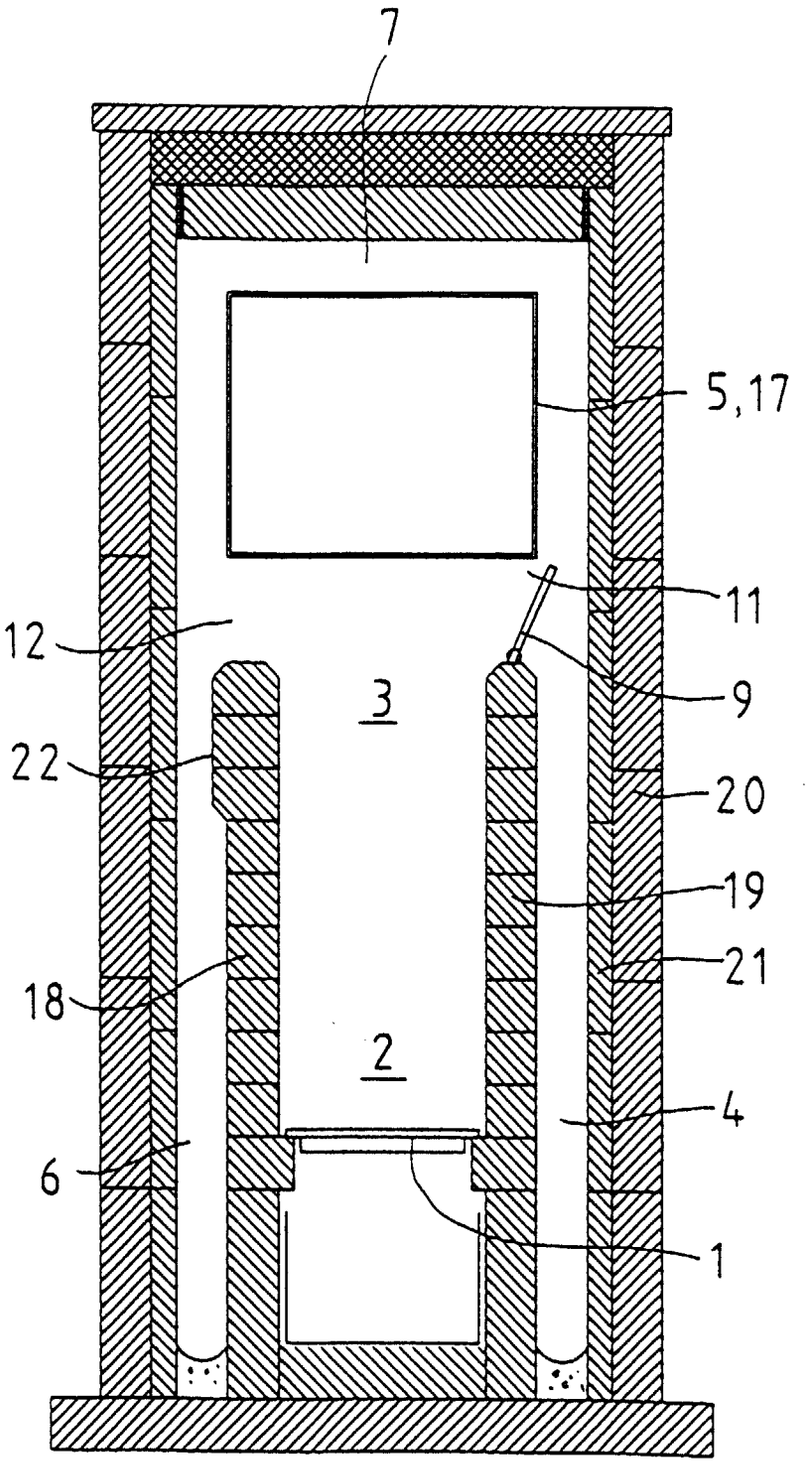

Fig 3

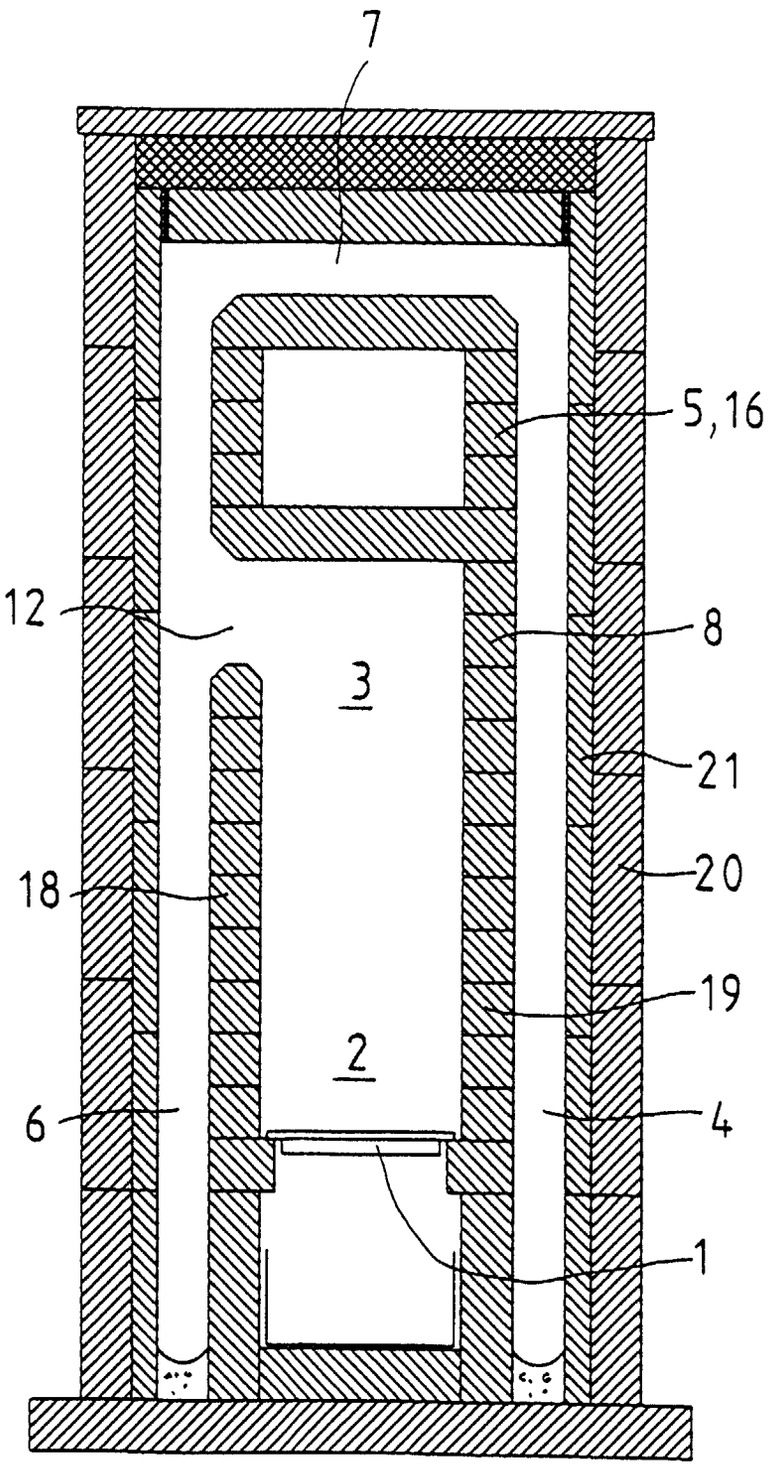

Fig 4

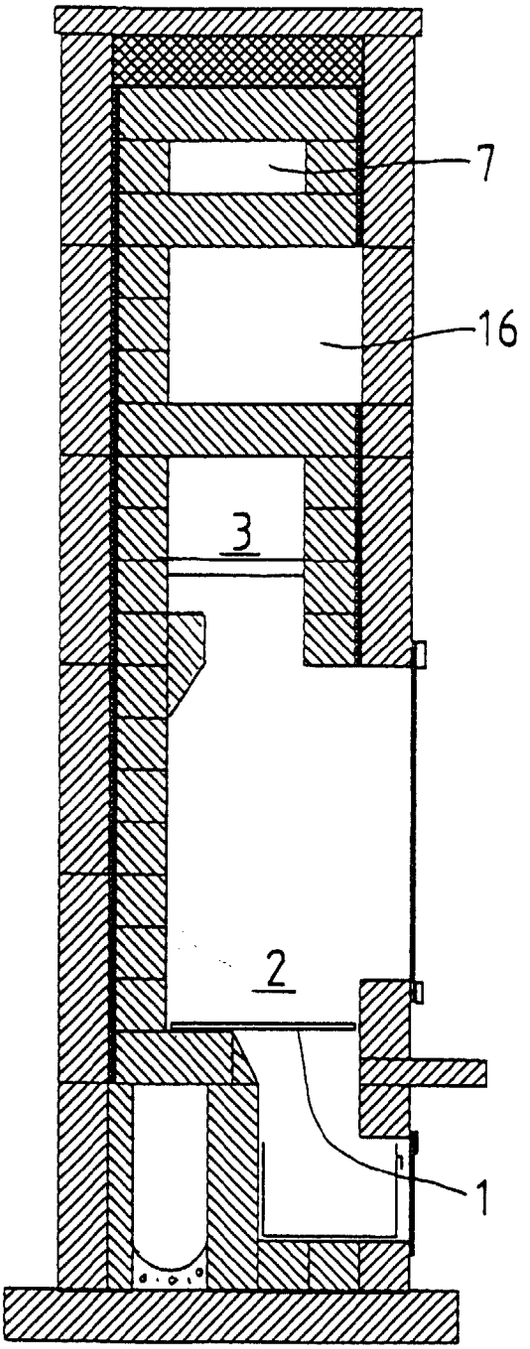

Fig 5