

Steam generator having at least one spiral-shaped steam channel and at least one flat resistive heating element

The present invention relates to a steam generator for use in a domestic appliance such as a steam iron, comprising: at least one channel unit enclosing a spiral-shaped steam channel for conducting water and steam through the channel unit; and at least one flat resistive heating element for heating a content of the steam channel of the at least one
5 channel unit.

Steam generators are well-known in practice. There is a need for applying steam for the purpose of various tasks, for example removing wallpaper from a wall on which
10 it has been glued, cleaning and ironing. In order to enable a user to apply steam during an ironing process, steam irons have been developed, which contain a steam generator, or which are connected to a steam generator located outside of the steam iron. In particular, the present invention relates to a steam generator which is suitable to be positioned inside a steam iron. Therefore, in the following, the steam generator will be described in the context of steam
15 irons having an internal steam generator. However, this does not mean that the present invention is not suitable to be applied in different situations and contexts; the present invention is relevant in all situations in which steam needs to be generated in a controlled manner. For example, the steam generator according to the present invention may also be applied in a facial steamer, a wallpaper remover steamer, a steam cleaning device and a
20 vacuum cleaner with a steam supply.

In general, a conventional steam iron comprises a soleplate having a contacting surface for contacting objects to be ironed, and a housing for accommodating various other components of the steam iron. In a usual embodiment, the soleplate comprises a bottom portion of a steam channel, which is part of a steam generator for generating steam
25 during operation of the steam iron. A cover is provided for covering the soleplate and closing the steam channel. The soleplate further includes a typically U-shaped tubular heating element, which serves for heating both the soleplate and the steam channel during operation of the steam iron. When the steam channel is heated, water that is inside the steam channel is

put to steam. For the purpose of letting out steam, steam openings are arranged in the soleplate, which are in communication with the steam channel.

During operation of the conventional steam iron as described in the preceding paragraph, the heating element is activated, and water is supplied to the steam channel. Under the influence of the heat supplied by the heating element, the temperature of the contacting surface of the soleplate increases, while the temperature prevailing inside the steam channel increases as well. As a result, water that is supplied to the steam channel is converted into steam. During an ironing process in which the steam iron is applied, the objects to be ironed are contacted by the hot contacting surface, while steam is supplied to these objects through the steam openings.

In order to improve the performance of the steam iron, it is desirable to apply a number of flat resistive heating elements instead of the U-shaped tubular heating element. Flat resistive heating elements are heating elements which are deposited as a thin layer on a surface by means of printing or other suitable techniques. Under the influence of an electric current, the flat resistive heating elements are capable of generating heat. For example, the flat resistive heating elements are formed by a layer of synthetic resin in which electrically conducting particles are embedded. When the flat resistive heating elements are arranged on a surface comprising an electrically conducting material such as metal, an electrically insulating layer needs to be arranged between the surface and the heating elements in order to avoid short-circuiting.

According to the current state of flat resistive heating technology, flat resistive heating elements are not suitable to be applied in an environment in which temperatures above a certain level occur. When the temperature of a heating element gets higher than a predetermined maximum allowable temperature, the heating element cracks and can not be used anymore. Therefore, the use of flat resistive heating elements is limited.

The length of the steam channel needs to be such that the water that is supplied to the steam channel can actually be converted into steam. Normally, the required length of the steam channel is much larger than the length of the soleplate. Therefore, the steam channel is usually shaped such as to follow a meandering path over the soleplate. It appears in practice that the temperature difference between an input and an output of such a steam channel is so large that it is not possible to apply flat resistive heating elements and have a reliable performance of the steam iron, as there is a considerable chance the heating elements crack under the influence of the relatively high temperature at the output of the steam channel.

According to the state of the art, a solution to the problem of the temperature at the output of a steam channel being too high for application of flat resistive heating elements is solved by providing spiral-shaped steam channels. A temperature difference between an input and an output of a spiral-shaped steam channel appears to be small enough to allow for the use of flat resistive heating elements for heating a content of the steam channel. Irrespective of the fact whether the water flows from a centre to a circumference of the steam generator or the other way around during operation, the temperature difference between the input and the output is small in comparison with the temperature difference which is applicable to a situation in which the steam channel has a zigzag shape or another shape which is more stretched than the spiral shape, so that a lower temperature at the output is realized.

In WO 02/27246, a steam iron having a flow heater is disclosed. During operation, the flow heater is kept at a temperature of more than 100°C, so that at least a major portion of the water introduced into the flow heater is converted into steam, and the flow heater acts like a steam generator. The water and the steam are conducted through the flow heater by means of a channel, which, in one possible embodiment, is arranged such as to follow a spiraling course. The channel is shaped like a duct, and is positioned between a planar heat distribution plate and a closing element. At a side of the heat distribution plate opposite to a side contacting the channel, heater elements are arranged, which comprise a resistance layer.

It is an objective of the present invention to improve the steam generator known from WO 02/27246, while maintaining the spiral shape of the steam channel and the application of resistive heating elements for heating a content of the steam channel. The objective is achieved by a steam generator which complies with the following description: a steam generator comprising at least one channel unit enclosing a spiral-shaped steam channel for conducting water and steam through the channel unit, wherein the least one channel unit comprises a body and a cover, wherein a spiral-shaped groove is arranged in the body, and wherein the cover covers at least a portion of the body in which the groove is arranged; and at least one flat resistive heating element for heating a content of the steam channel of the at least one channel unit, which is arranged on a surface of the body of the at least one channel unit.

According to an important aspect of the present invention, the steam generator comprises at least one channel unit and at least one flat resistive heating track arranged on a surface of the body of the at least one channel unit. The channel unit has a relatively simple design, as it only comprises a body in which a spiral-shaped groove is arranged and a cover for closing the groove. Thus, the channel unit comprises a steam channel which is enclosed by the body and the cover, more in particular, by walls of the groove arranged in the body and the cover.

In the steam generator according to the present invention, the at least one flat resistive heating element is arranged on a surface of the body of the at least one channel unit. In this way, it is assured that a major portion of the steam channel is directly heated, as a result of which the heating process of the content of the steam channel is relatively very efficient.

Preferably, the body of the at least one channel unit of the steam generator according to the present invention is a casting. An important advantage related to this preferred embodiment of the body is that the process needed for manufacturing it, i.e. a casting process, is relatively simple.

A steam generator having a spiral-shaped steam channel and at least one flat resistive heating element for heating a content of the steam channel has important advantages. In general, in a spiral-shaped steam channel, the content is forced to follow a spiral-shaped path, wherein the content is subjected to centrifugal forces. As a result, the wall of the steam channel is intensely contacted by the content of the steam channel, and heat transfer efficiency is relatively high.

Preferably, the steam generator according to the present invention comprises steam promotion means for promoting the conversion of water to steam in the steam channel. Normally, if steam promotion means are present in a steam generator, these steam promotion means are only arranged on a bottom portion of an inner surface of the wall of the steam channel. According to the present invention, the steam promotion means cover more than just this bottom portion, preferably the entire inner surface of the wall of the steam channel, following the insight that the wall of the steam channel is intensely contacted due to its spiral course. Within the scope of the present invention, all suitable types of steam promotion means may be applied, for example mechanical steam promotion means such as wire mesh or aluminum foam.

The present invention and its advantages will now be explained in greater detail with reference to the figures, in which similar parts are indicated by the same reference signs, and in which:

Fig. 1 is a diagrammatical top view of a steam generator according to a first preferred embodiment of the present invention, wherein a cover of the steam generator is removed;

Fig. 2 is a diagrammatical view of a section taken along a line A-A in Fig. 1;

Fig. 3 is a diagrammatical top view of a soleplate of a steam iron;

Fig. 4 is an exploded view of a steam generator according to a second preferred embodiment of the present invention;

Fig. 5 is a diagram illustrating the operation of the steam generator as shown in Fig. 4;

Fig. 6 is an exploded view of a steam generator according to a third preferred embodiment of the present invention; and

Fig. 7 is a diagrammatical top view of a steam generator according to a fourth preferred embodiment of the present invention, wherein a cover of the steam generator is removed.

Figs. 1 and 2 show a steam generator 1 according to a first preferred embodiment of the present invention. The steam generator comprises a channel unit 18 having two main components, i.e. a body 20 and a cover 10. Fig. 1 is a diagrammatical top view of the steam generator 1, wherein the cover 10 of the channel unit 18 is removed, so that a top side of the body 20 is visible. Consequently, the cover 10 is only shown in Fig. 2, which is a diagrammatical sectional view of the steam generator 1.

In the shown example, the body 20 of the channel unit 18 is shaped as a disc having a circular circumference. In a preferred embodiment, the body 20 is a casting. In the body 20, a spiral-shaped groove 30 is arranged. The cover 10 is positioned at the side of the body 20 where the spiral-shaped groove 30 is, and serves for closing the groove 30, so that a spiral-shaped steam channel 34 which is closed at a top side is obtained. The cover 10 comprises a central hole 11, which gives access to a central portion 31 of the spiral-shaped steam channel 34.

Besides the spiral-shaped groove 30, a connection channel 32 is arranged in the body 20, which serves for giving access to an end portion 33 of the steam channel 34

from a circumferential surface 21 of the body 20. In Fig. 1, the position of the connection channel 32 is indicated by means of dashed lines.

At a side of the body 20 which is not covered by the cover 10, a flat resistive heating element 40 is arranged. In the shown example, the heating element 40 is shaped as a rectangular piece which covers at least part of the surface of the body 20 on which it is arranged, which, for the sake of clarity, will hereinafter be referred to as bottom surface 22 of the body 20. Furthermore, in the following, the opposite surface of the body 20, which is covered by the cover 10, will be referred to as top surface 23.

During operation of the steam generator 1, the heating element 40 is activated under the influence of an electric current, and transmits heat to the body 20. As a result, the temperature prevailing inside the spiral-shaped steam channel 34 is put at a relatively high level, above 100°C, such that water that is present inside the spiral-shaped steam channel 34 is converted to steam. A movement of water and steam through the spiral-shaped steam channel 34 is automatically obtained as a result of the expansion process which takes place at the moment water evaporates and steam is formed inside the steam channel 34.

The steam generator 1 may be applied in two different ways. According to a first option, water is supplied to the steam generator 1 through the central hole 11 in the cover 10, and enters the steam channel 34 at the central portion 31. Furthermore, steam exits the steam generator 1 at the end portion 33 of the spiral-shaped steam channel 34, through the connection channel 32. According to a second option, water is supplied to the steam generator 1 through the connection channel 32, and enters the spiral-shaped steam channel 34 at the end portion 33. Furthermore, steam exits the steam generator 1 at the central portion 31 of the spiral-shaped steam channel 34, through the central hole 11 of the cover 10.

The application of the steam generator 1 according to the present invention has many advantages, which are related to the fact that the steam channel 34 is spirally shaped and the fact that at least one flat resistive heat element 40 is arranged on the body 20 for the purpose of heating the content of the spiral-shaped steam channel 34.

During operation, the content of the spiral-shaped steam channel 34 is forced to move through the steam channel 34. Primarily, the content is forced to move from the central portion 31 of the spiral-shaped steam channel 34 to the end portion 33 of the steam channel 34 or the other way around, dependent of where the water is supplied (the position where the water is supplied may be determined with a view of facilitation of scale discharge or the construction of the steam generator 1 and/or of a steam appliance in which the steam generator 1 is incorporated). Secondary, the content of the spiral-shaped steam channel 34

tends to rotate along a wall of the steam channel 34. Furthermore, the content is pushed towards an outer portion of the wall of the spiral-shaped steam channel 34 under the influence of centrifugal forces. As a result of the secondary movement of the content and the movement under the influence of centrifugal forces, complete contact between the wall of the spiral-shaped steam channel 34 and the content of the steam channel 34 is ensured, whereby a relatively high heat transfer efficiency is obtained. In experimental tests, it has been found that scale forms a ring shape at the cross-section of the spiral-shaped steam channel 34, which confirms the occurrence of the secondary movement of the content.

Due to the fact that the spiral shape of the steam channel 34 causes the heating process of the content of the steam channel 34 to be very efficient, taken in combination with the fact that flat resistive heating elements 40 are applied, the steam generator 1 may be of a relatively light-weight and small design. For example, the dimensions of the spiral-shaped steam channel 34 may be as small as 3x3 mm or even 2x2 mm, while the steam generator 1 is still capable of supplying steam at a rate of, for example, up to 52 grams per minute. On the other hand, it is also possible that the dimensions of the cross-section of the steam channel 34 are chosen such as to be 7x7 mm or even larger. Due to the above-described secondary movement of the content of the steam channel 34, which is caused by the fact that the steam channel 34 is spirally shaped, good contact between this content and the wall of the steam channel 34 is also ensured at larger dimensions of the cross-section of the steam channel 34. A very important advantage of a steam channel 34 having a larger cross-section is that such a steam channel 34 is capable of containing more scale, whereby the life of the steam generator 1 is prolonged. Another advantage is that the internal pressure may be lower.

In a steam channel having a more stretched overall shape, for example a steam channel having a zigzag shape, contact between the content of the steam channel and the wall of the steam channel mainly takes place at a bottom portion of the steam channel under the influence of gravity. It will be understood that the heating process aimed at generating steam is less efficient in such a steam channel than in a spiral-shaped steam channel. Therefore, it is impossible for such a steam channel to have a cross-section which is as small as 2x2 mm on the one hand and be suitable for application in a steam generator of a steam iron on the other hand. Furthermore, it is also impossible for such a steam channel to have a relatively large cross-section and function properly.

In a spiral-shaped steam channel 34 spiraling in a circular fashion, no sharp deflections are present. As an advantageous consequence, scale is evenly deposited inside the steam channel 34, and scaling life of the steam generator 1 is relatively long. When the water

is supplied at the end portion 33 of the spiral-shaped steam channel 34, the movement of the content of the steam channel 34 towards the central portion 31 of the steam channel 34 helps to discharge scale at this central portion 31.

In the radial direction, the spiral-shaped steam channel 34 comprises a number
5 of dividing walls delimiting annular portions of the steam channel 34 having different distances with respect to the centre of the spiral shape. In case the water is supplied at the central portion 31 of the spiral-shaped steam channel 34, the presence of multiple dividing walls prevents water droplets from escaping between the cover 10 and the top surface 23 of the body 20. This is an important feature of the spiral-shaped steam channel 34, as in an
10 industrial application, it is extremely difficult to achieve complete sealing between the two surfaces, while at the same time meeting the requirements of keeping the costs low and producing the steam generators 1 in mass. A few walls acting as barriers to prevent the steam generator 1 from leaking water droplets (a process which is also known as "spitting") is much more viable and preferred than other measures aimed at the prevention of spitting. The
15 advantageous effect of the spiral shape of the steam channel 34 on the sealing between the top surface 23 of the body 20 and the cover 10 is even more appreciated in case the steam generator 1 is used in a so-called boiler system, in which pressurized steam is conducted through the steam channel 34.

In a spiral-shaped steam channel 34, the absolute distance between the inlet
20 and the outlet is much smaller than in a zigzag steam channel having the same length. The same is true for the temperature difference. Therefore, the performance of the spiral-shaped steam channel 34 is more reliable, and warping of the body 20 and/or the heating elements 40 is prevented.

In comparison with known U-shaped tubular heating elements, flat resistive
25 heating elements 40 are capable of supplying heat in a more efficient way. Therefore, in many cases, the application of such heating elements 40 is preferred. In case the steam channel 34 has a spiral shape, the temperature difference between the inlet and the outlet of the steam channel 34 is small enough for the steam channel 34 to be combined with flat resistive heating elements 40. In case of the steam channel having a zigzag shape or another
30 more stretched shape, the temperature difference between the inlet and the outlet of the steam channel is considerably higher, and the flat resistive heating elements 40 can not be applied, as these heating elements 40 may crack under the influence of the relatively high temperature at the outlet of the steam channel 34.

The spiral-shaped steam channel 34 may be shaped as shown in Fig. 1, but may also have another shape. For example, the steam channel 34 may spiral in ovals, triangles or rectangles. Naturally, the triangles and rectangles are less preferred, as these shapes comprise sharp deflections.

5 The spiral shape of the groove 30 which is disclosed in Fig. 1 resembles the shape of a so-called Archimedean spiral. However, within the scope of the present invention, various types of spiral shapes are possible. The steam channel 34 may have the shape of any type of two-dimensional spiral, for example a logarithmic spiral, a sinusoidal spiral or Euler's spiral.

10 The spiral-shaped steam channel 34 may be heated at one side, as is the case in the example shown in Figs. 1 and 2. However, it is also possible that the heating elements 40 are arranged at more sides of the spiral-shaped steam channel 34, for example on the top surface 23 of the body 20. The arrangement of flat resistive heating elements 40 is not limited to flat surfaces; the heating elements 40 may also be arranged on the circumferential surface
15 21 of the body 20. In such case, dispensing techniques may be applied in the process of arranging the heating elements 40 on the surface 21.

Normally, the cross-section of the spiral-shaped steam channel 34 has a rectangular shape. Within the scope of the present invention, other shapes are also possible, for example a triangular shape, a hexagonal shape or an irregular shape.

20 Steam generators are suitable for application in various domestic appliances, for example a steam iron, and may be incorporated in such appliances. In Fig. 3, a top side of a soleplate 50 of a steam iron is diagrammatically shown. The soleplate comprises a generator base 15 in which a spiral-shaped groove 30 is arranged. In the steam iron, the generator base 15 is covered by means of a cover (not shown in Fig. 3). Like the body 20 and
25 the cover 10 of the steam generator 1 as shown in Figs. 1 and 2, the generator base 15 and the cover form a channel unit enclosing a spiral-shaped steam channel. This channel unit is part of a steam generator unit, which further comprises at least one flat resistive heating element (not shown in Fig. 3) arranged on the generator base 15.

In the shown embodiment, during operation of the steam iron, water enters the spiral-shaped
30 steam channel at its central portion, and steam exits the steam channel at its end portion. In Fig. 3, a path which is followed by the water and the steam through the steam channel of the channel unit during operation of the steam iron is indicated by means of a thick line.

The generator base 15 is positioned in a generator chamber 51 of the steam iron, of which a bottom portion is delimited by a top surface 52 of the soleplate 50 and a first

rib 53. In the shown example, two holes 54 are provided in the first rib 53, giving access to a steam distribution chamber 55 surrounding a substantial portion of the generator chamber 51, of which a bottom portion is delimited by the top surface 52 of the soleplate 50, the first rib 53 and a second rib 56. In Fig. 3, two paths leading through the holes 54 in the first rib 53 into the steam distribution chamber 55, which are followed by steam exiting the channel unit, are indicated by means of a thick line/arrow.

Preferably, the soleplate 50, including the generator base 15 and the ribs 53, 56, is formed as a casting.

In the steam iron, both the generator chamber 51 and the steam distribution chamber 55 are closed by a cover (not shown in Fig. 3). In a practical embodiment of the steam iron, one overall cover for covering the chambers 51, 55 as well as the groove 30 of the generator base 15 may be provided. In the steam distribution chamber 55, steam openings 57 are provided in the soleplate 50 for letting through steam to the material being positioned underneath the soleplate 50, which needs to be steamed and/or ironed.

The steam generator according to the present invention may be used to generate more than just one type of steam, for example wet steam, which is defined as a steam-water mixture, saturated steam and super-heated steam, depending on which type of steam is needed at a certain stage. For this purpose, the steam generator preferably comprises at least two channel units 18 having spiral-shaped steam channels 34, wherein the steam channels 34 are interconnected. An example of a steam generator 2 which is suitable for generating different types of steam is diagrammatically shown in Fig. 4.

The steam generator 2 as shown in Fig. 4 comprises a bottom channel unit 18a and a top channel unit 18b, which, in the shown example, are of the same general design. Both channel units 18a, 18b comprise a body 20 which is shaped like a disc having a rectangular circumference having round edges, and in which a spiral-shaped groove 30 is arranged. Furthermore, both channel units 18a, 18b comprise a cover 10 for covering the side of the body 20 where the spiral-shaped groove 30 is, so that a spiral-shaped steam channel 34 is formed. The covers 10 of the channel units 18a, 18b preferably comprise metal. Besides the spiral-shaped groove 30, the body 20 of the channel units 18a, 18b comprises a circular groove 37 for receiving sealing means such as an O-ring or the like, which circular groove 37 encompasses the spiral-shaped groove 30.

At a bottom side of the bottom channel unit 18a, a central hole 11 is provided, which gives access to a central portion 31 of the spiral-shaped steam channel 34 of the bottom channel unit 18a. Likewise, at a top side of the top channel unit 18b, a central hole 11

is provided, which gives access to a central portion 31 of the spiral-shaped steam channel 34 of the top channel unit 18b. Furthermore, both channel units 18a, 18b comprise a connection channel 32, which gives access to an end portion 33 of the spiral-shaped steam channel 34 from a circumferential surface 21 of the body 20 of the respective channel unit 18a, 18b.

5 The cover 10 of the bottom channel unit 18a is positioned at a top side thereof, whereas at a bottom side of the bottom channel unit 18a, a flat resistive heating element (not shown in Fig. 4) is arranged, for the purpose of heating a content of the steam channel 34 of the bottom channel unit 18a. Likewise, the cover 10 of the top channel unit 18b is positioned at a bottom side thereof, whereas at a top side of the top channel unit 18b, a flat resistive
10 heating element 40 is arranged. In the shown example, the flat resistive heating elements 40 comprise flat resistive heating tracks having substantially the same spiral shape as the steam channels 34.

 Between the covers 10 of the channel units 18a, 18b, a heat insulating plate 45 is arranged, which comprises a heat insulating material such as mica.

15 During operation of the steam generator 2, the heating elements 40 are switched on. Water is supplied to the steam generator 2 at the central portion 31 of the spiral-shaped steam channel 34 of the top channel unit 18b, and wet steam or saturated steam exits the top channel unit 18b through its connection channel 32. Subsequently, the wet steam or saturated steam is supplied to the bottom channel unit 18a, wherein the steam enters the
20 spiral-shaped steam channel 34 of the bottom channel unit 18a at its end portion 33. Finally, super-heated steam exits the bottom channel unit 18a at the central portion 31 of the spiral-shaped steam channel 34. For the purpose of conducting the steam from the end portion 33 of the spiral-shaped steam channel 34 of the top channel unit 18b to the end portion 33 of the spiral-shaped steam channel 34 of the bottom channel unit 18a, a tube or the like is arranged,
25 which is not shown in the exploded view of Fig. 4.

 It is not necessary that all of the steam exiting the top channel unit 18b is supplied to the bottom channel unit 18a. When the steam generator 2 is part of a steam iron, a portion of the wet steam or saturated steam may be supplied to a spray nozzle, for example. For the purpose of portioning the steam, a valve or the like may be applied.

30 The channel units 18a, 18b of the steam generator 2 may have many characteristics in common, but this is not necessary. Preferably, the design of each channel unit 18a, 18b is adapted to the type of steam that needs to be obtained. For example, characteristics of the cross-section of the steam channel 34 may be adjusted to the type of steam that needs to be supplied by the channel unit 18a, 18b. Thus, in the shown example, the design of the bottom

channel unit 18a may be optimized with a view of the supply of super-heated steam, whereas the design of the top channel unit 18b may be optimized with a view of the supply of wet steam or saturated steam.

5 In Fig. 5, the channel units 18a, 18b, the course which is followed by the water and/or steam during operation of the steam generator 2, and the condition of the water and/or steam are diagrammatically depicted as an illustration of the process taking place in the steam generator 2 during operation.

Fig. 6 is an exploded view of a steam generator 3 which resembles the steam generator 2 as shown in Fig. 4 to a large extent. In fact, the only difference pertains to the number of plates between the bodies 20 of the channel units 18a, 18b. In the steam generator 2 as shown in Fig. 4, three plates are present between the bodies 20 of the components 18a, 18b, i.e. a cover 10 for covering the top side of the bottom channel unit 18a, a heat insulating plate 45, and a cover 10 for covering the bottom side of the top channel unit 18b. In the steam generator 3 as shown in Fig. 6, only one cover 41 is present between the bottom channel unit 15 18a and the top channel unit 18b.

The steam generators 2, 3 as shown in Figs. 4 and 6 comprise two spiral-shaped steam channels 34. According to the present invention, in case the steam generator comprises more than one steam channel 34, the number of steam channels 34 may be higher than two.

20 Fig. 7 shows a circular steam generator 4 according to the present invention, which comprises a body 20 in which a channel chamber 35 is provided. In the shown example, the channel chamber 35 is divided into seven spiral-shaped steam channels 34 by means of seven curved dividing walls 36 extending between a centre of the steam generator 4 and a circumference of the steam generator 4. In this way, steam channels 34 extending 25 between a centre of the steam generator 4 and a circumference of the steam generator 4, in a spiraling fashion, are realized. It will be clear that a width of the spiral-shaped steam channels 34 is larger near the circumference of the steam generator 4, and smaller near the centre of the steam generator 4. Therefore, during normal use of the steam generator 4, water is supplied at the centre of the steam generator 4, and steam exits the steam generator 4 at the 30 circumference of the steam generator 4.

At one side, the steam chamber 35 is closed by means of a bottom 24 of the body 20. Like the steam generator 1 as shown in Figs. 1 and 2, the steam generator 4 comprises a cover (not shown in Fig. 7) for closing another side of the channel chamber 35, which cover has a central hole for providing access to the centre of the steam generator 4.

Furthermore, the steam generator 4 comprises at least one flat resistive heating element (also not shown in Fig.7) arranged on an outer surface of the body 20 for heating a content of the channel chamber 35 during operation of the steam generator 4.

Preferably, steam promotion means are used to promote water evaporation in the steam channel 34. In case the steam channel 34 does not have a spiral shape, and steam promotion means are present, these means are only applied to a bottom portion of the steam channel 34, as this portion is the only portion that is contacted by the content of the steam channel 34. However, in the spiral-shaped steam channel 34 which is part of the steam generator 1, 2, 3, 4 according to the present invention, it is preferred that the steam promotion means are applied to the entire inner surface of the steam channel 34. This does not alter the fact that the steam promotion means may also only be applied to a bottom portion of the steam channel 34.

When steam promotion means are present, the efficiency of the steam generator 1, 2, 3, 4 is increased. Furthermore, a steam generator 1, 2, 3, 4 having steam promotion means is better capable of meeting heavy duty requirements. The steam promotion means also play a role in the prevention of spitting.

The steam promotion means may be designed in any conceivable way. For example, the inner surface of the steam channel 34 may be roughened by means of sand blasting to stimulate water spreading and to increase the number of nucleation sites.

Furthermore, commercially available products for promoting steam may be applied. According to another option, mechanical measures are taken, including covering the inner surface of the steam channel 34 with wire mesh, aluminum foam, fine grids or an array of spikes. According to yet another option, chemical means such as anodizing, Xylan, QF & Ludox can also be taken as steam promotion means.

It will be clear to a person skilled in the art that the scope of the present invention is not limited to the examples discussed in the foregoing, but that several amendments and modifications thereof are possible without deviating from the scope of the present invention as defined in the attached claims.

It is remarked that the term "water", which has been used in the above, should not be understood such as to only cover pure water in a chemical sense (H_2O) or distilled water, but any fluid that is normally supplied to a steam generator, for example tap water or a mixture of water and a garment treatment agent.

The simplest embodiment of the cover 10, 41 of the channel unit 18 is a plate having a planar top surface and a planer bottom surface. However, that does not alter the fact that a spiral-shaped groove may be arranged in a surface of the cover 10, 41 which is intended to contact the body 20, wherein the shape of the spiral of the groove in the cover 10, 41 and the shape of the spiral of the groove 30 in the body 20 are each other's mirror images, such as to fit well to each other in order to form the steam channel 34.

CLAIMS:

1. Steam generator (1, 2, 3, 4) for use in a domestic appliance such as a steam iron, comprising:
 - at least one channel unit (18) enclosing a spiral-shaped steam channel (34) for conducting water and steam through the channel unit (18), wherein the at least one channel
 - 5 unit (18) comprises a body (20) and a cover (10), wherein a spiral-shaped groove (30) is arranged in the body (20), and wherein the cover (10) covers at least a portion of the body (20) in which the groove (30) is arranged; and
 - at least one flat resistive heating element (40) for heating a content of the steam channel (34) of the at least one channel unit (18), which is arranged on a surface of the
 - 10 body (20) of the at least one channel unit (18).
2. Steam generator (1, 2, 3, 4) according to claim 1, wherein the body (20) of the at least one channel unit (18) is a casting.
- 15 3. Steam generator (2, 3) according to claim 1 or claim 2, comprising at least two channel units (18), wherein the spiral-shaped steam channels (34) of the channel units (18) are interconnected.
4. Steam generator (2, 3) according to claim 3, wherein the channel units (18) are
- 20 arranged in a stack.
5. Steam generator (2, 3) according to claim 3 or claim 4, comprising at least one pair of channel units (18), wherein the two channel units (18) of the at least one pair are stacked in opposite orientations, such that sides of the bodies (20) in which the spiral-shaped
- 25 groove (30) is arranged face each other.
6. Steam generator (3) according to claim 5, wherein the channel units (18) share one cover (41) for closing the spiral-shaped grooves (30) of the channel units (18).

7. Steam generator (1, 2, 3) according to any of claims 1-6, wherein a cross-section of the spiral-shaped steam channel (34) at most equals 3x3 mm.
8. Steam generator (1, 2, 3) according to any of claims 1-6, wherein a cross-section of the spiral-shaped steam channel (34) at least equals 7x7 mm.
9. Steam generator (4) according to any of claims 1-6, wherein a channel chamber (35) is provided in the body (20) of the at least one channel unit (18), which channel chamber (35) is divided into n spiral-shaped steam channels (34) by means of n curved dividing walls (36) extending between a centre of the steam generator (4) and a circumference of the steam generator (4), wherein n is an integer.
10. Steam generator (1, 2, 3, 4) according to any of claims 1-9, comprising steam promotion means for promoting the conversion of water to steam in the spiral-shaped steam channel (34) of the at least one channel unit (18), which steam promotion means cover a substantial portion of an inner surface of the steam channel (34), which substantial portion is more than just a bottom portion.
11. Steam iron, comprising a steam generator (1, 2, 3, 4) according to any of claims 1-10.
12. Soleplate (50) for a steam iron, comprising a generator base (15) in which a spiral-shaped groove (30) is arranged, and at least one flat resistive heating element arranged on a surface of the generator base (15).
13. Soleplate (50) according to claim 12, which is a casting.
14. Steam iron, comprising a soleplate (50) according to claim 12 or claim 13, wherein a cover is provided for closing the spiral-shaped groove (30) of the generator base (15).