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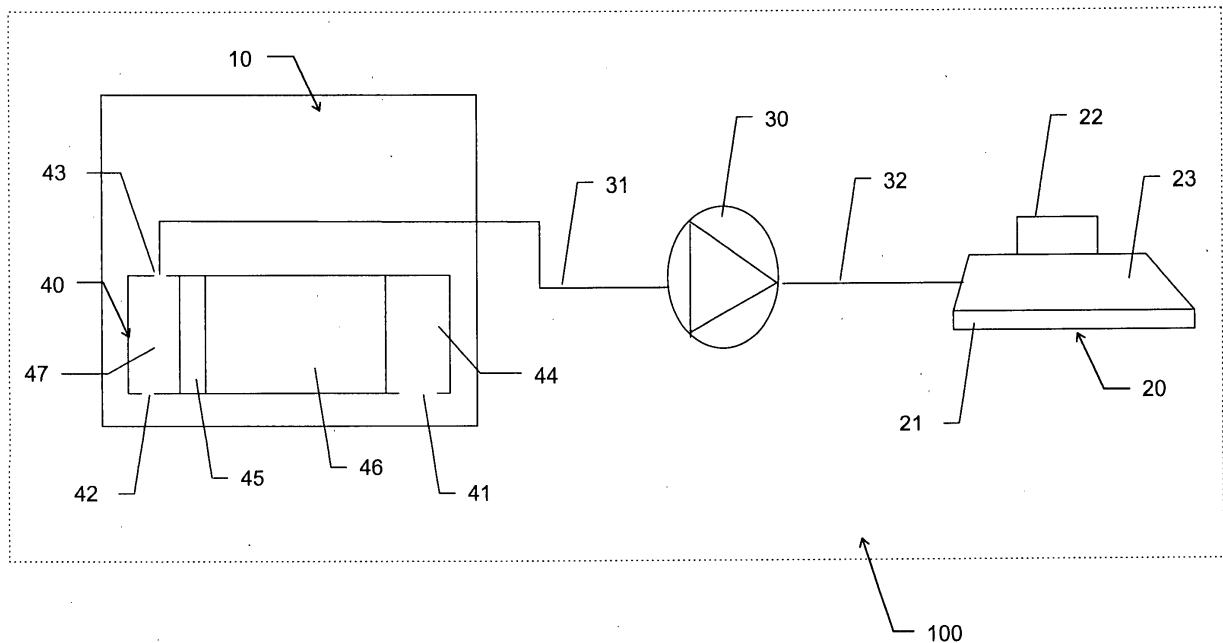
(54) Ironing apparatus comprising a filter

(57) An ironing apparatus (100) comprising

- an iron (20),
- a water reservoir (10) comprising a filter (40) for reducing the hardness of the water, and
- a pump (30) connected between the reservoir (10)

and the iron (20) adapted to draw a first amount of water from the reservoir (10) making it pass through the filter (40) and to supply the first amount of water thus filtered to the iron (20),

wherein the pump (30) is also adapted to draw a second amount of water from the reservoir (10), lower than the first amount, and to supply it unfiltered to the iron (20).



Figure

Description

[0001] The present invention refers to an ironing apparatus. In particular, the present invention refers to an ironing apparatus of the type comprising an iron, a water reservoir at room temperature and at atmospheric pressure and a pump for feeding water from the reservoir to the iron.

[0002] Typically, in such ironing apparatuses the iron comprises a main body adapted to contain the water coming from the reservoir, a perforated heat conducting metal plate on the base of the main body and heat generation means associated with said plate for heating it during use. In these types of irons steam is generated when the water at room temperature comes into contact with the boiling plate and then goes out from the holes in the plate.

[0003] In these types of apparatuses, where water is vaporised directly on the plate of the iron, the salts contained in the water can form incrustations on the plate during the evaporation step. Typically, such incrustations mainly consist of carbon deposits, hydrates and calcium and magnesium sulphates.

[0004] To reduce the formation of such incrustations, ironing apparatuses are known in which the water reservoir is provided with a ion exchange resin filter to reduce the hardness of the water. By making the water percolate through commercially available ion exchange resins it is possible to obtain a hardness of the water of less than 2°F, starting from a hardness of 30°F.

[0005] Such a reduction in hardness of the water allows the formation of incrustations to be substantially reduced and, therefore, allows the useful life of the iron to be lengthened.

[0006] Another typical problem of ironing apparatuses in which water is vaporised directly on the plate of the iron is the calefaction phenomenon. According to such a phenomenon the water at room temperature that comes into contact with the boiling plate of the iron forms droplets of water that are then ejected from the holes in the plate in liquid state. Such droplets can leave stains on the fabrics to be ironed and are in general unpleasant for the user.

[0007] A technique of the prior art for avoiding the problem of calefaction is that of coating the surface of the plate of the iron with a suitable porous varnish adapted to absorb the water droplets that form due to calefaction.

[0008] However, such varnishes must be sufficiently porous, withstand high temperatures (for example, up to 300 °C) and must be such as not to detach from the plate during use. To avoid the detachment of the varnish, the plate must be subjected to an accurate pickling process, before the application of the varnish. This involves long application times and relatively high costs.

[0009] An alternative technique of the prior art for avoiding the problem of calefaction provides for the formation of micro pores on the surface of the plate through application of suitable chemical mixtures that attack the metal of the plate. However, the Applicant observes that

this technique does not allow a sufficient porosity to be obtained to effectively absorb the water droplets that form due to calefaction.

[0010] Therefore the Applicant faced the technical problem of avoiding, in an effective and inexpensive way, the problem of calefaction in ironing apparatuses equipped with a water reservoir in which water is vaporised through contact with the hot plate of the iron.

[0011] In a first aspect thereof the present invention therefore relates to an ironing apparatus comprising

- an iron,
- a water reservoir comprising a filter for reducing the hardness of the water, and
- a pump connected between the reservoir and the iron adapted to draw a first amount of water from the reservoir making it pass through the filter and to feed the first amount of water thus filtered to the iron,

characterised in that the pump is also adapted to draw a second amount of unfiltered water from the reservoir, lower than the first amount, and to supply it to the iron.

[0012] In the ironing apparatus of the invention - in which a mixture of filtered water and unfiltered water is supplied to the iron - the water on the whole supplied to the iron has a greater hardness than that of the filtered water. This advantageously allows, right from the first time the iron is used, a layer of deposits to be formed on the metal plate which is adapted to absorb the water droplets possibly formed due to the phenomenon of calefaction.

[0013] Advantageously, the first and second amounts of water are such as to obtain the desired hardness for the water on the whole supplied to the iron.

[0014] In particular, the first and second amount of water are advantageously selected so as to effectively reduce the problem of calefaction right from the first time the iron is used and - at the same time - so as not to compromise the useful life of the iron.

[0015] For such a purpose, when the first amount of filtered water has a nominal hardness greater than zero and no greater than 2 °F, the first and second amount of water supplied by the pump to the iron have an overall hardness that is preferably greater than 2 °F. Preferably, the first and second amount of water have an overall hardness greater than 3 °F. Advantageously, the first and second amounts of water have an overall hardness less than 12 °F. Preferably, such a hardness is comprised between 4 and 10 °F. Even more preferably, it is comprised between 6 and 7 °F.

[0016] In this regard, the Applicant observes that the first and second amount of water must, in general, be selected according to the hardness of the water contained in the reservoir and to the filtering capacity of the filter (or rather according to the hardness of the filtered and unfiltered water). Typically, in the art, a filter that

provides a hardness of the water that is not greater than 2°F, starting from a tap water having a nominal hardness of about 30°F, is considered.

[0017] Advantageously, the pump is adapted to provide the iron with the first amount of filtered water, mixed with the second amount of unfiltered water.

[0018] Typically, the filter comprises filtering material. Advantageously, the filtering material comprises ion exchange resins. Typically, the filtering capacity of ion exchange resins is such as to obtain filtered water with a hardness not greater than 2 °F when the water contained in the reservoir has a nominal hardness equal to about 30°F.

[0019] Advantageously, the filter comprises a first inlet for the water to be filtered.

[0020] The filter advantageously comprises an outlet connected to the pump.

[0021] The first inlet is advantageously in communication with the outlet.

[0022] The filter advantageously comprises a filtering zone. The first inlet is advantageously in communication with the outlet through the filtering zone.

[0023] The filtering zone typically comprising filtering material for the passage of the water to be filtered from the first inlet towards the outlet, through the filtering material.

[0024] Typically, the filter comprises water-permeable retaining elements adapted to hold the filtering material inside the filtering zone and at the same time to allow the passage of the water through them. Typically, such retaining elements are polypropylene filters or felts.

[0025] Preferably, the filter also comprises a second inlet for the water. The second inlet is advantageously in communication with the outlet.

[0026] Preferably, the filter also comprises a mixing zone, distinct from the filtering zone, which connects the second inlet to the outlet.

[0027] Advantageously, the mixing zone also connects the filtering zone to the outlet.

[0028] The outlet of the filter is advantageously situated at the mixing zone.

[0029] The second inlet of the filter is advantageously situated at the mixing zone.

[0030] The first inlet is advantageously situated near the filtering zone.

[0031] The mixing zone is advantageously separated from the filtering zone through at least one of the retaining elements.

[0032] Advantageously, the first and second inlet have physical characteristics such that the overall amount of water at the outlet of the filter, sucked by the pump through the first and second inlet, has the desired proportions of filtered water and unfiltered water.

[0033] Advantageously, the first and second inlet are of a size such that the overall amount of water at the outlet of the filter, sucked by the pump through the first and second inlet, has the desired proportions of filtered water and unfiltered water.

[0034] Advantageously, the filter has an elongated shape. Preferably, it has a cylindrical shape. Advantageously, the filter extends for most of the length of the water reservoir.

[0035] In a second aspect thereof the present invention relates to a method for reducing the phenomenon of calefaction in an ironing apparatus comprising a water reservoir and an iron, said method comprising the steps of

a) filtering a first amount of water of the reservoir;

b) drawing the first amount of filtered water from the reservoir and supplying it to the iron;

characterised in that it also comprises step c) of drawing a second amount of unfiltered water from the reservoir, lower than the first amount, and supplying it to the iron.

[0036] As far as the characteristics of the first and second amount of water are concerned, reference is made to what disclosed above with reference to the first aspect of the invention.

[0037] Further characteristics and advantages of the present invention shall become clearer from the following detailed description of a preferred embodiment thereof, made with reference to the attached drawing. In particular, such a drawing shows a schematic view of an ironing apparatus of the invention.

[0038] The ironing apparatus 100 of the invention shown comprises an iron 20, a pump 30, a water reservoir 10 at room temperature and at atmospheric pressure and two ducts 31, 32 for respectively connecting the reservoir 10 to the pump 30 and the pump 30 to the iron 20.

[0039] The iron 20 is of the conventional type and typically comprises a main body 23, a grip 22, a heat conducting metal plate 21 fixed to the base of the main body 23 and heat generation means (not shown) associated with said plate 21 to heat it during use.

[0040] The pump 30 is adapted to draw water from the reservoir 10 and to supply it to the main body 23 of the iron 20.

[0041] The pump 30 is of the conventional type, typically an electric micro-pump.

[0042] Steam is generated in a known way when the water comes into contact with the boiling plate 21, heated by means of the heat generation means.

[0043] The plate 21 is typically equipped with holes (not shown) for the emission of the generated steam. Moreover, it is typically made from aluminium.

[0044] The heat generation means typically comprise a conventional electrical resistance embedded in the plate 21.

[0045] The water reservoir 10 comprises a filter 40.

[0046] In the described example the filter 40 comprises ion exchange resins as filtering material.

[0047] In the art ion exchange resins are known that are capable of reducing the hardness of water to values of no more than 2°F, starting from a hardness of the water of 30 °F. For example, such resins are commercially

available from the company Purolite.

[0048] The filter 40 comprises a housing having a first inlet 41 and a second inlet 42 for the water contained in the reservoir 10 and an outlet 43 connected to the pump 30.

[0049] The housing is preferably made from polypropylene that is a low-cost material readily available on the market and easy to seal by welding.

[0050] The inlets 41, 42 can, for example, consist of a hole of any shape, for example circular, or a channel having, for example, a circular section.

[0051] In the illustrated embodiment the filter 40 is situated on the base of the reservoir 10. Suitable supports (not shown) hold the filter 40 raised from the base of the reservoir 10, for example by a few mm, to allow the water to enter through the two inlets 41, 42.

[0052] Moreover, in the illustrated embodiment, the two inlets 41, 42 are positioned at the two opposite ends of the base of the filter 40.

[0053] The filter 40 also comprises a filtering zone 46 with the filtering material for the passage of the water to be filtered from the first inlet 41 towards the outlet 43, through the filtering material. Typically, the filtering zone 46 is bounded at the top and at the bottom by the walls of the housing of the filter 40 and at the two ends by a first and a second retaining element 44, 45 that are permeable to water and adapted to hold the filtering material inside the filtering zone 46, preventing it from escaping from the inlets 41, 42, and at the same time to allow the passage of the water through them. Typically, such retaining elements 44, 45 are filters made from polypropylene or felts.

[0054] The filter 40 also comprises a mixing zone 47, distinct from the filtering zone 46, which connects the second inlet 42 to the outlet 43.

[0055] The filtering zone 46 is in communication with the outlet 43 through the mixing zone 47.

[0056] In the illustrated embodiment, the filtering zone 46 and the mixing zone 47 are separated by the second retaining element 45.

[0057] In particular, in the illustrated embodiment, the mixing zone 47 is defined in part by the walls of the filter 40 and in part by the second retaining element 45.

[0058] In use, when the pump 30 is in operation, part of the water of the reservoir 10 enters into the filter 40 through the first inlet 41, passes through the first retaining element 44, through the filtering zone 46 in which it is filtered by the filtering material, through the second retaining element 45, through the mixing zone 47 and exits from the outlet 43 to be supplied to the main body 23 of the iron 20 through the ducts 31, 32. Moreover, part of the water of the reservoir 10 enters into the filter 40 through the second inlet 42, passes through the mixing zone 47 in which it is mixed with the filtered water coming from the filtering zone 46 and exits from the outlet 43 to be supplied thus mixed to the main body 23 of the iron 20 through the ducts 31, 32.

[0059] The proportions of filtered and unfiltered water,

pumped by the pump 30 through the inlets 41 and 42, generally depend upon the physical characteristics thereof like, for example, the size and the type of surface with which the water comes into contact.

[0060] The physical characteristics of the inlets and, in particular, their size are advantageously selected so as to obtain a hardness of the mixed water supplied to the iron 20 comprised between 3 and 12 °F, preferably comprised between 4 and 10 °F and, more preferably, comprised between 6 and 7 °F.

[0061] Indeed, the Applicant has found that such hardness values of the water allow the problem of calefaction to be effectively avoided right from the first use of the iron and at the same time allow the useful life of the iron to be kept within the values typically required on the market.

[0062] More specifically, the Applicant has found that such hardness values for the mixed water ensure that, right from the first use of the iron, a light layer of deposits forms on the plate of the iron that allows the water droplets possibly formed due to the phenomenon of calefaction to be effectively absorbed and, at the same time, allows the useful life of the iron not to be compromised.

[0063] The Applicant observes that the hardness of the mixed water supplied to the iron shall depend, as well as upon the physical characteristics of the inlets, also upon the hardness of the starting water contained in the reservoir and upon the filtering capacity of the filter. Therefore, the apparatus of the invention shall be designed taking into account average reference values of hardness of the starting water and of filtering capacity, according to the market under consideration. For example, the hardness of the tap water is typically comprised between 15 and 50°F. A value conventionally considered for the hardness of the tap water is 30 °F. Moreover, an ion exchange resin filter typically used in conventional ironing apparatuses provides a hardness of the water typically of no more than 2°F, starting from a hardness of about 30°F.

[0064] For example, in order to obtain a hardness of the water comprised between 4 and 10 °F and, more preferably, comprised between 6 and 7 °F - considering a nominal hardness of tap water of 30 °F, a filtering material that provides a nominal hardness of the filtered water of no more than 2°F and the case in which the two inlets 41, 42 consist of two channels with circular section - the ratio between the diameter of the first inlet 41 and the diameter of the second inlet 42 is advantageously comprised between 0.04 mm and 1 mm, the length of the channel of the first inlet 41 is advantageously comprised between 0.1 mm and 0.5 mm whereas the length of the channel of the second inlet 42 is advantageously comprised between 1 mm and 5 mm.

[0065] The Applicant observes that commercially available conventional filters, used in conventional ironing apparatuses, provide the iron with filtered water having a hardness typically of no more than 2°F, starting from a hardness of the water equal to about 30 °F. With such a hardness value of the water, the layer of deposits

that forms with time on the plate of the iron allows the water droplets formed by means of the phenomenon of calefaction to be effectively absorbed only after many uses of the iron (typically, only after having consumed about 15 litres of water) and not, like in the iron of the present invention, right from the first use.

[0066] Advantageously, the filter 40 has a narrow elongated shape, for example cylindrical. This advantageously allows the entire flow of water that passes through the filtering zone 46 to be effectively filtered. That is, the narrow shape allows the flow of water to fully come into contact with all of the filtering material contained in the filtering zone 46 whereas the elongated shape allows the flow of water to remain in contact with the filtering material for a relatively long time (equal to about 2-4 minutes).

[0067] Moreover, in a preferred embodiment, the filter 40 extends for most of the length of the water reservoir 10. This advantageously allows the amount of filtering material contained in the filtering zone 46, and thus the useful life of the filter, to be increased.

[0068] For example, the filter 40 has a volume of 130 cc and is able to contain 100-120 gr of ion exchange resins. This allows a useful life of the filter equal to at least 110 litres to be obtained.

[0069] Regarding this, the Applicant observes that conventional ironing apparatuses typically have a water reservoir with a replaceable filter and an opening to allow the passage of the filter at the time of its replacement. For this purpose, the filter is typically small in size. Typically, conventional filters are adapted to contain 60 gr of ion exchange resins, which allows a useful life of the filter of no more than 80 litres to be obtained.

[0070] Moreover, to allow an effective filtering despite the small size of the filter, the latter typically has a labyrinth-shaped filtering zone to allow the flow of water to remain in contact with the filtering material for a suitable time.

[0071] However, the labyrinth-shaped filtering zone involves higher production time and costs with respect to the linear shape (for example cylindrical) of the filtering zone of the filter of the apparatus of the invention.

Claims

1. An ironing apparatus (100) comprising

- an iron (20),
- a water reservoir (10) comprising a filter (40) for reducing the hardness of the water, and
- a pump (30) connected between the reservoir (10) and the iron (20) adapted to draw a first amount of water from the reservoir (10) making it pass through the filter (40) and to supply the first amount of water thus filtered to the iron (20),

characterised in that the pump (30) is also adapted

to draw a second amount of unfiltered water from the reservoir (10), lower than the first amount, and to supply it to the iron (20).

2. Ironing apparatus (100) according to claim 1, wherein the filter (40) comprises a first inlet (41) for the first amount of water to be filtered.
3. Ironing apparatus (100) according to claim 1, wherein the filter (40) comprises an outlet (43) connected to the pump (30).
4. Ironing apparatus (100) according to claim 3, wherein the filter (40) comprises a first inlet (41) in communication with the outlet (43).
5. Ironing apparatus (100) according to claim 1, wherein the filter (40) comprises a second inlet (42).
6. Ironing apparatus (100) according to claim 3, wherein the filter (40) comprises a second inlet (42) in communication with the outlet (43).
7. Ironing apparatus (100) according to claim 4, wherein the filter (40) comprises a filtering zone (46) comprising filtering material for the passage of the water to be filtered from the first inlet (41) towards the outlet (43), through the filtering material.
8. Ironing apparatus (100) according to claims 6 and 7, wherein the filter (40) also comprises a mixing zone (42), distinct from the filtering zone (46), which connects the second inlet (42) to the outlet (43).
9. Ironing apparatus (100) according to claim 8, wherein the mixing zone (42) also connects the filtering zone (46) to the outlet (43).
10. Ironing apparatus (100) according to claim 1, wherein, when the first amount of filtered water has a nominal hardness of more than zero and not more than 2 °F, the first and second amount of water supplied by the pump (30) to the iron (20) have an overall hardness of more than 2 °F.
11. Ironing apparatus (100) according to claim 10, wherein the first and second amount of water have an overall hardness of more than 3 °F.
12. Ironing apparatus (100) according to claim 10, wherein the first and second amount of water have an overall hardness of less than 12 °F.
13. Ironing apparatus (100) according to claim 10, wherein the first and second amount of water have an overall hardness comprised between 4 and 10 °F.
14. Ironing apparatus (100) according to claim 13,

wherein the first and second amount of water have an overall hardness comprised between 6 and 7 °F.

15. Method for reducing the phenomenon of calefaction in an ironing apparatus comprising a water reservoir and an iron, said method comprising the steps of

- a) filtering a first amount of water of the reservoir;
- b) drawing the first amount of filtered water from the reservoir and supplying it to the iron;

characterised in that it also comprises the step c) of drawing a second amount of unfiltered water from the reservoir, lower than the first amount, and supplying it to the iron.

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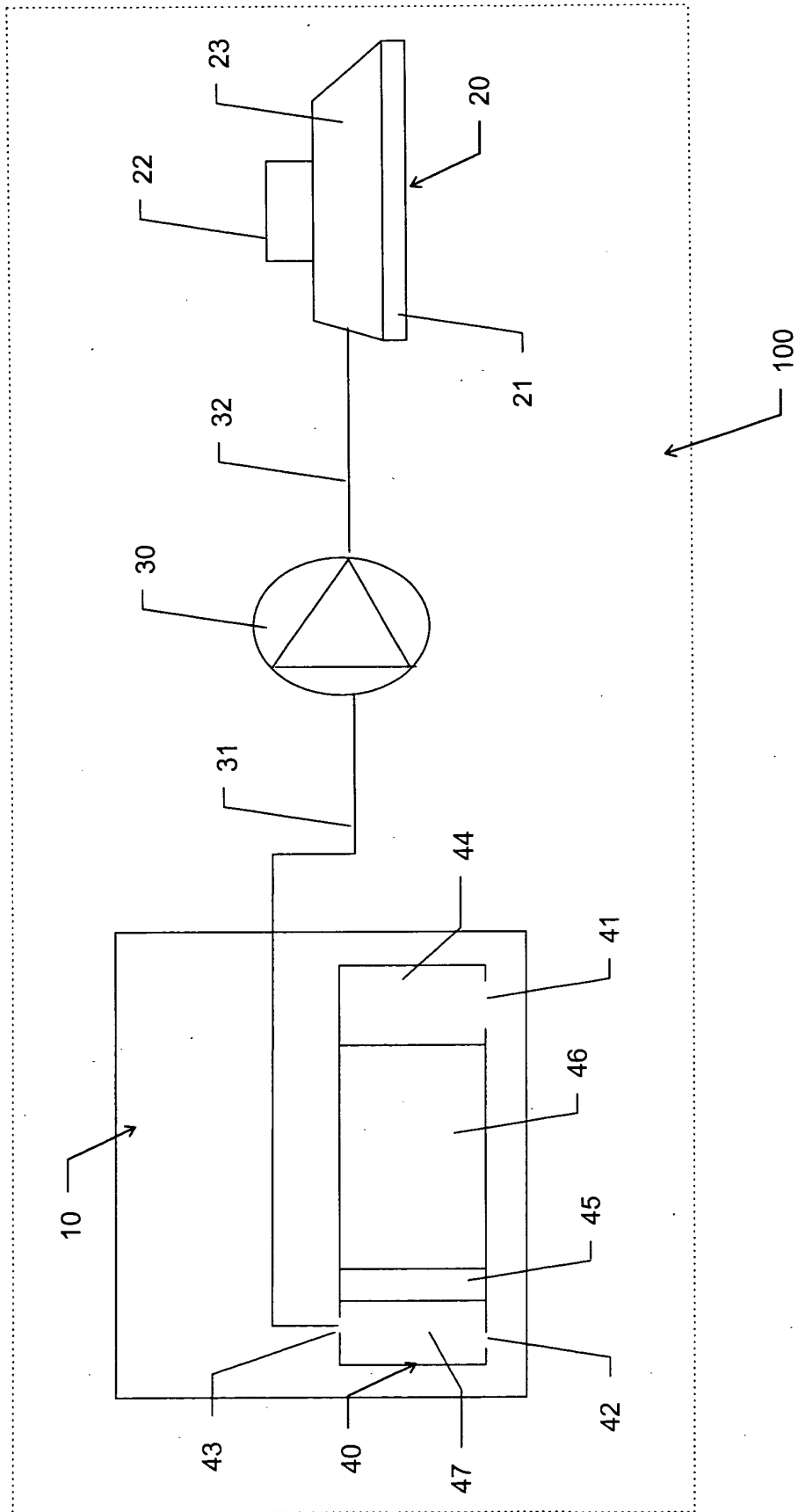
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Figure



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5529

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Place of search Munich		Date of completion of the search 9 December 2004	Examiner Falkentoft, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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