US 20100299975A1

(19) **United States**

(12) **Patent Application Publication**

Thomas

(10) **Pub. No.: US 2010/0299975 A1**

(43) **Pub. Date: Dec. 2, 2010**

(54) **STEAM IRON**

(75) Inventor: **Mark Thomas**, Leichhardt (AU)

Correspondence Address:
SCHWEGMAN, LUNDBERG & WOESSNER, P.A.
P.O. BOX 2938
MINNEAPOLIS, MN 55402 (US)

(73) Assignee: **Sunbeam Corporation Limited**, Botany (AU)

(21) Appl. No.: **12/776,836**

(22) Filed: **May 10, 2010**

(30) **Foreign Application Priority Data**

May 11, 2009 (AU) 2009902072

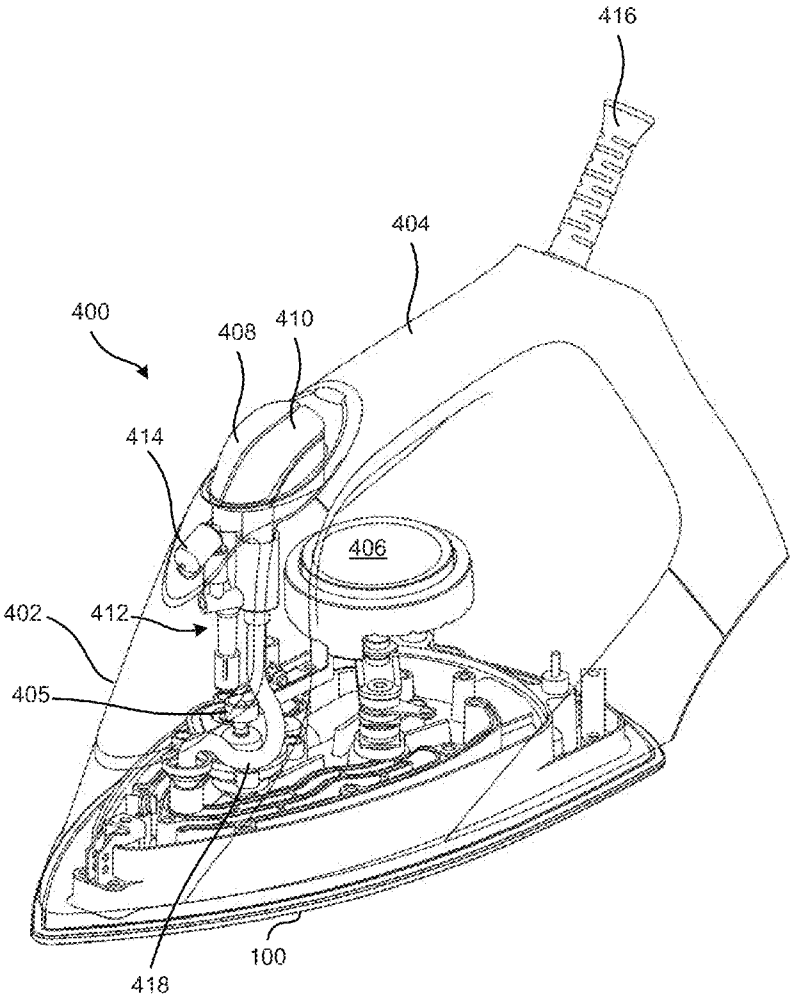
Publication Classification

(51) **Int. Cl.**
D06F 75/10 (2006.01)
D06F 75/38 (2006.01)

(52) **U.S. Cl.** **38/77.83**; 38/93

(57) **ABSTRACT**

An electric steam iron is described. The iron includes a water reservoir and a soleplate. The soleplate includes a base, a heating element, a constant steam chamber in fluid communication with a plurality of constant steam chamber apertures passing through the base, and a steam shot chamber. The steam shot chamber includes a front cavity and a steam shot channel in thermal communication with the heating element and in fluid communication with the front cavity, the front cavity including at least one steam shot chamber aperture passing through the base, the steam shot channel defining a pair of flow paths substantially overlying the heating element, each flow path having a re-entrant shape. The iron further includes a constant steam chamber water delivery means for delivering water from the water reservoir into the constant steam chamber, and a steam shot chamber water delivery means for delivering water from the water reservoir into the steam shot chamber in the soleplate.



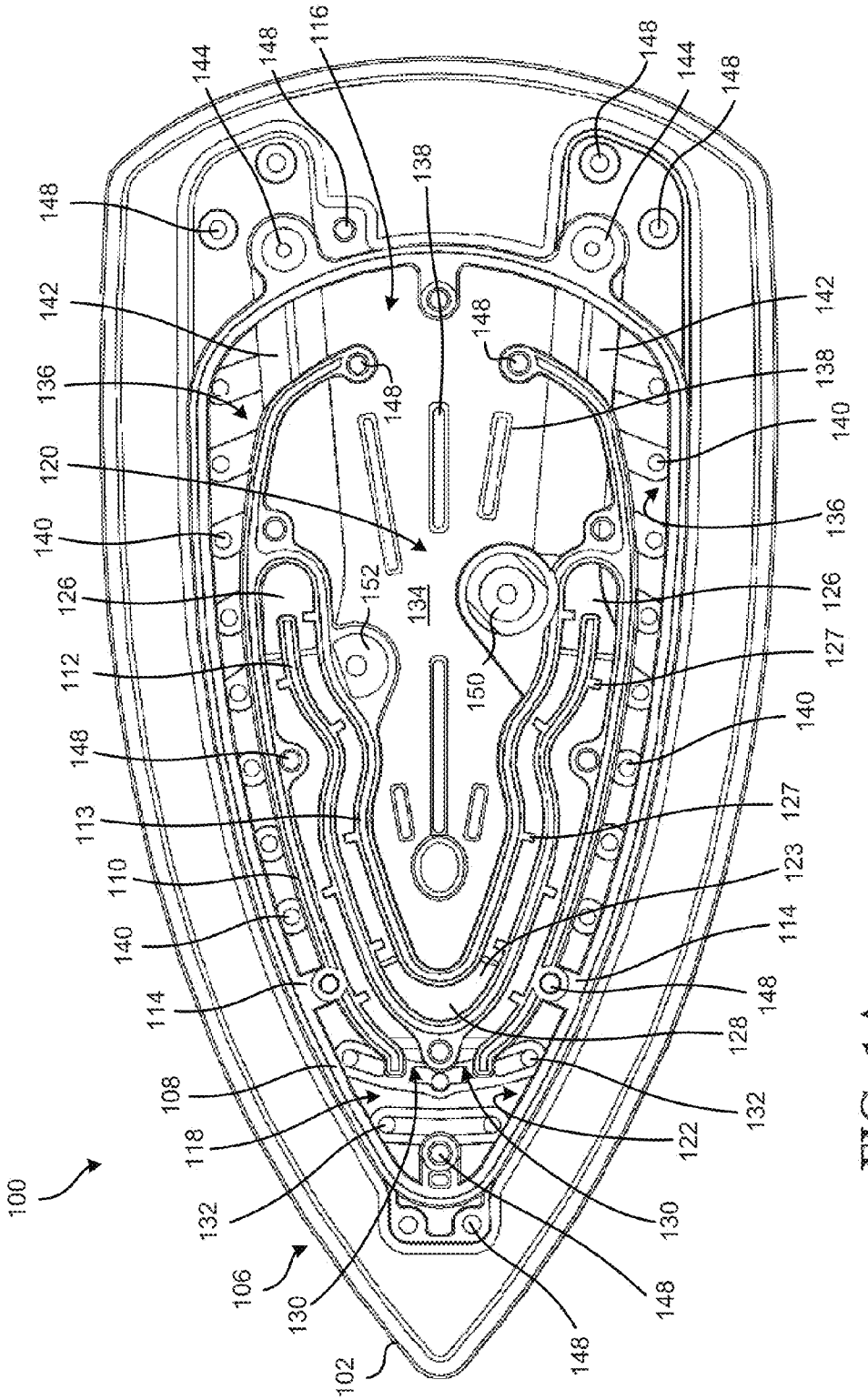

100
102
106
108
110
112
113
114
116
118
120
122
123
126
127
128
130
132
134
136
138
140
142
144
148
150
152

FIG. 1A

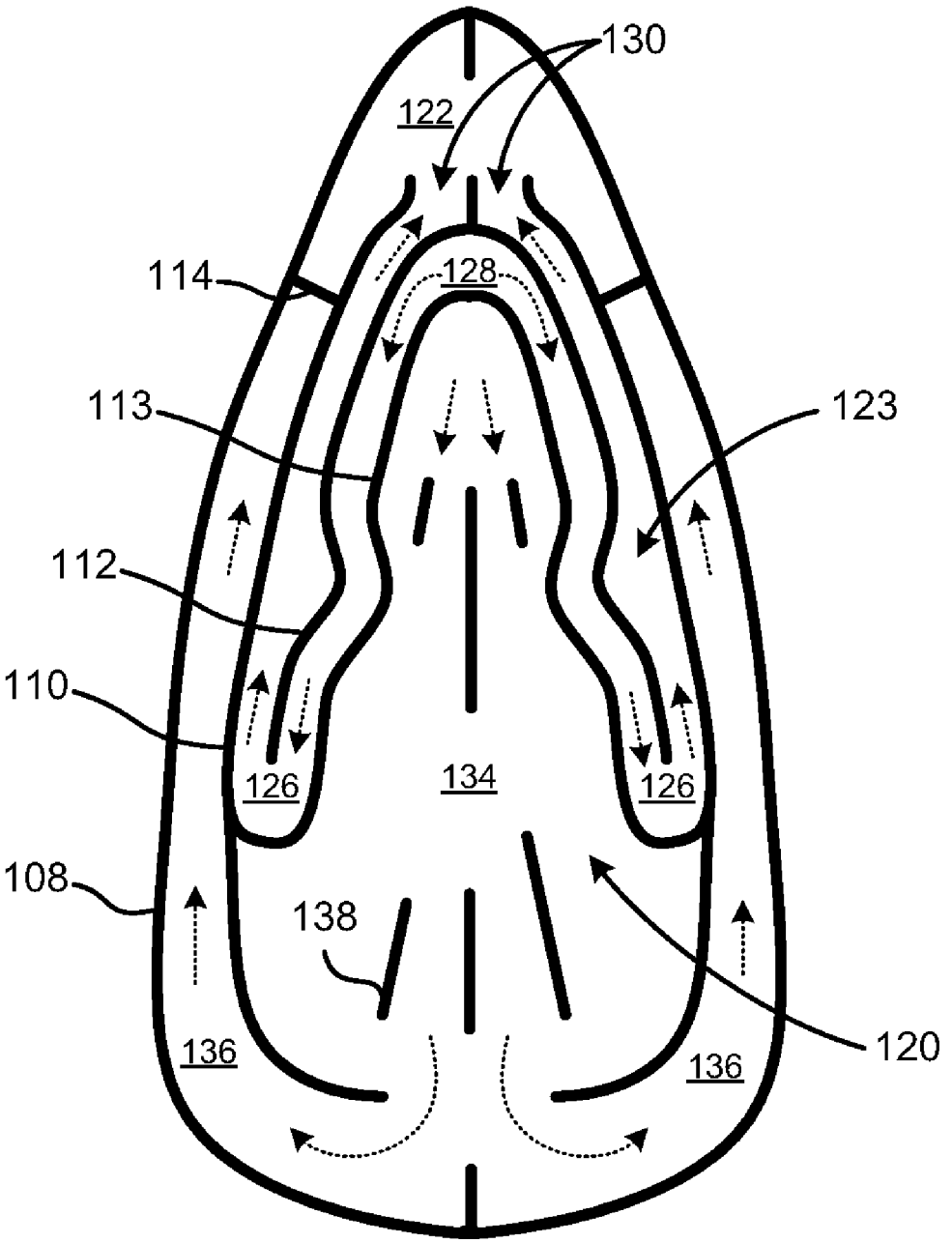


FIG. 1B

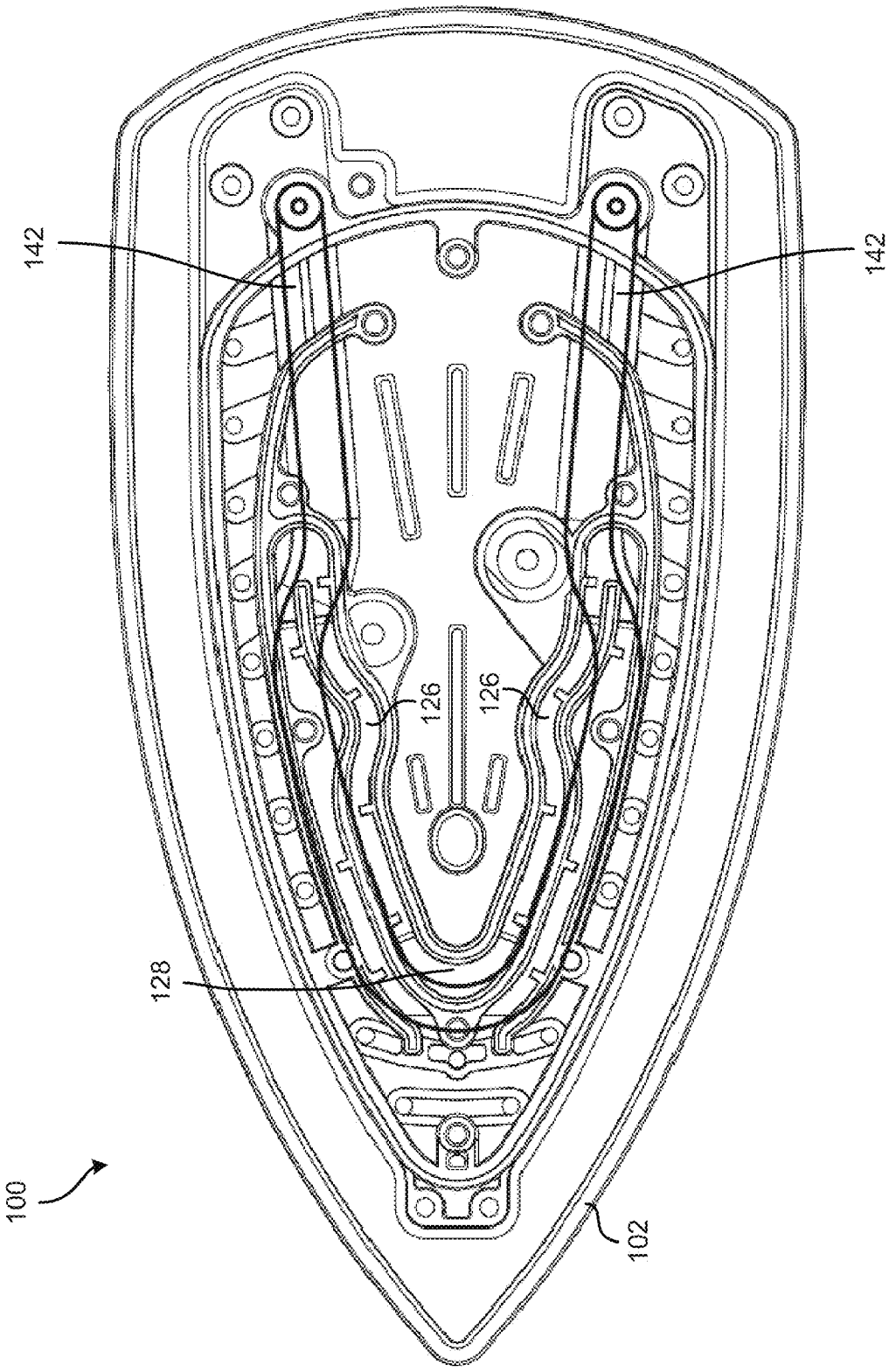


FIG. 1C

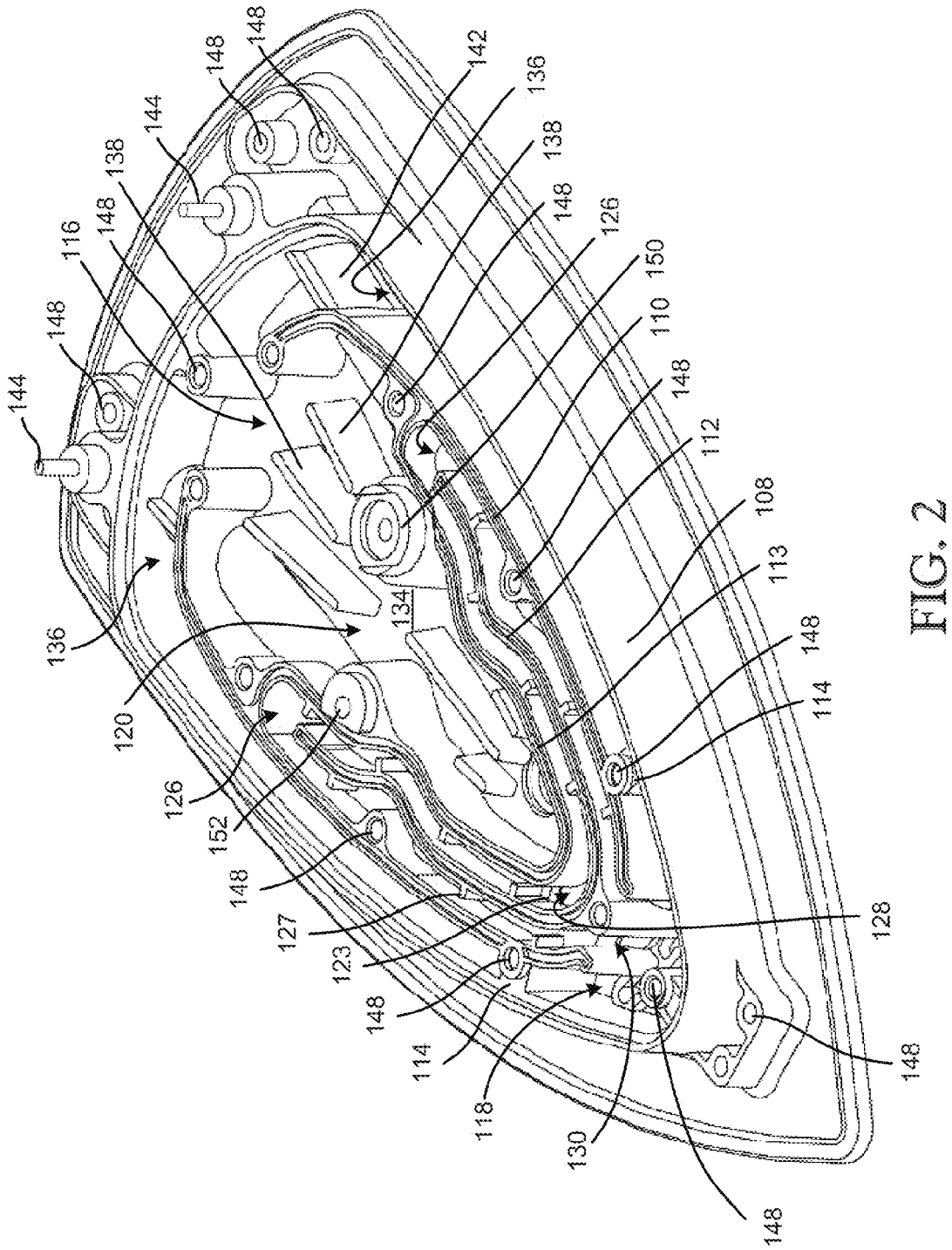

148
144
138
116
148
148
144
136
120
126
152
148
127
123
148
114
118
130
148
148
114
128
148
113
108
112
148
110
150
126
148
138
136
142
134

FIG. 2

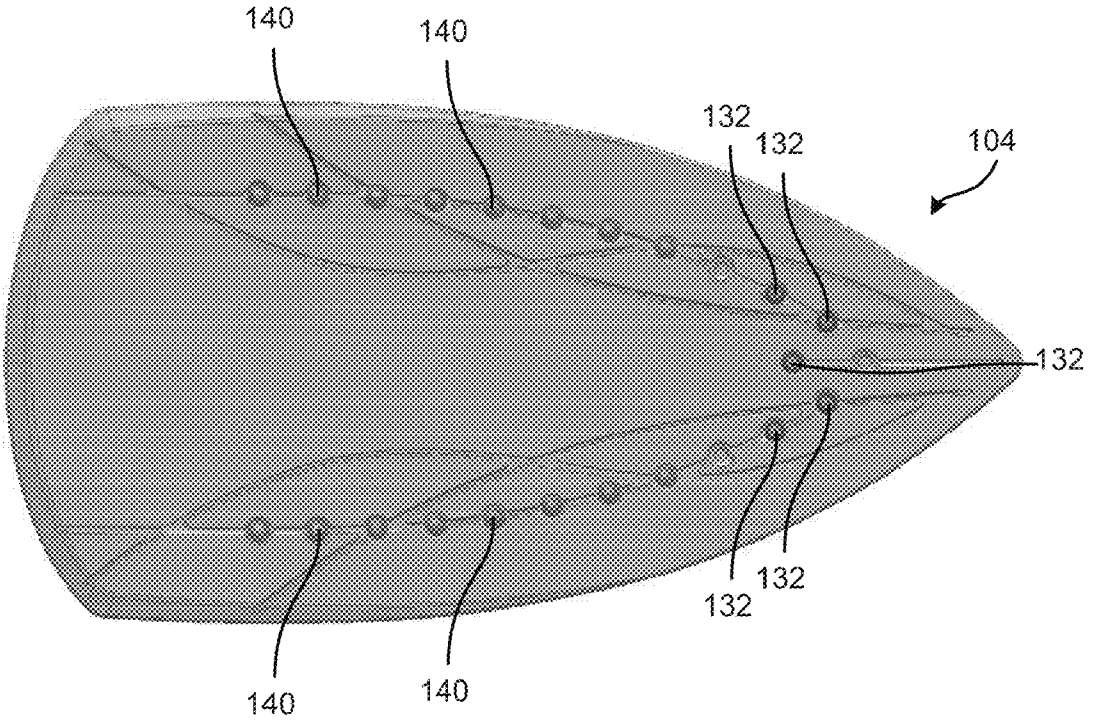


FIG. 3

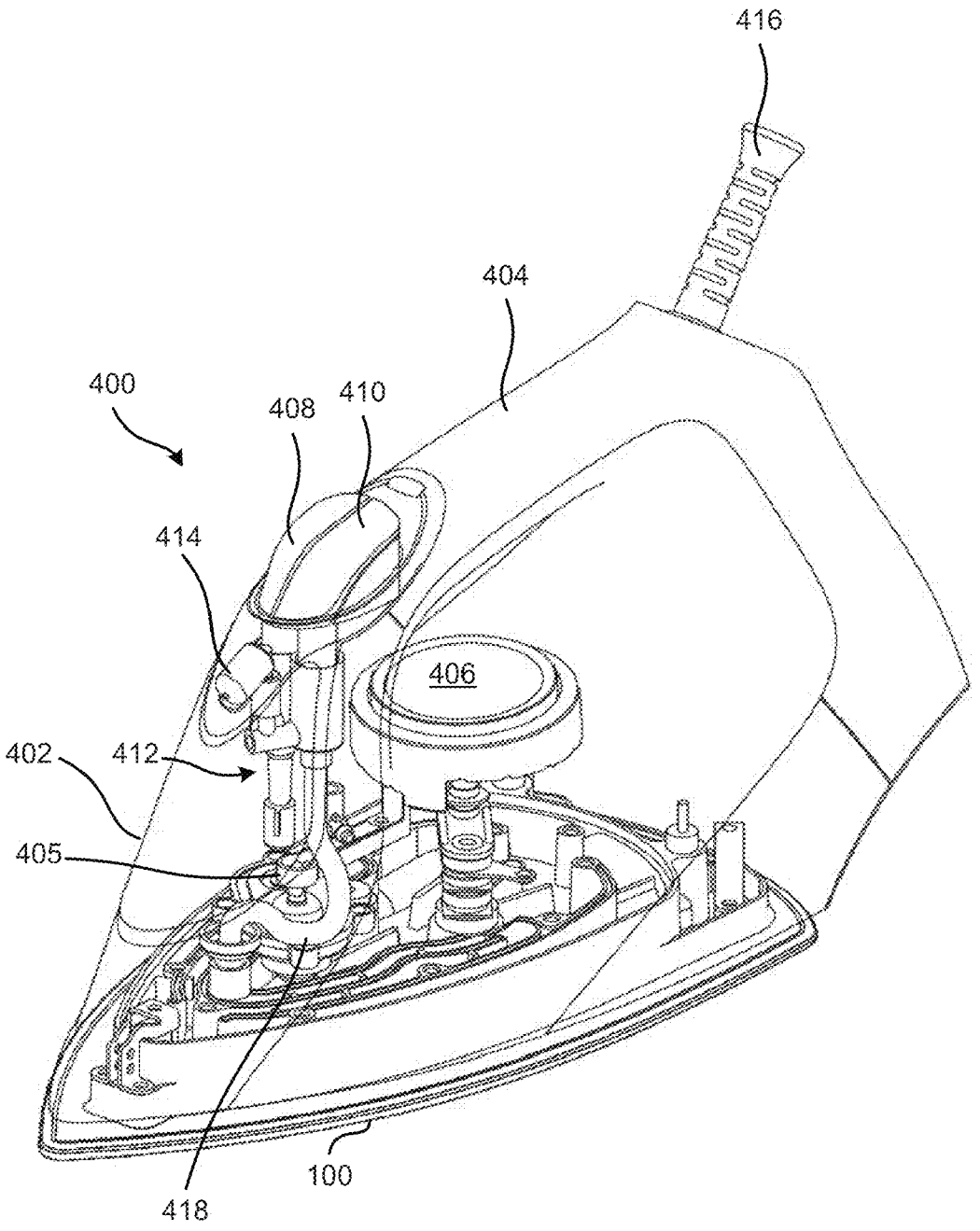


FIG. 4

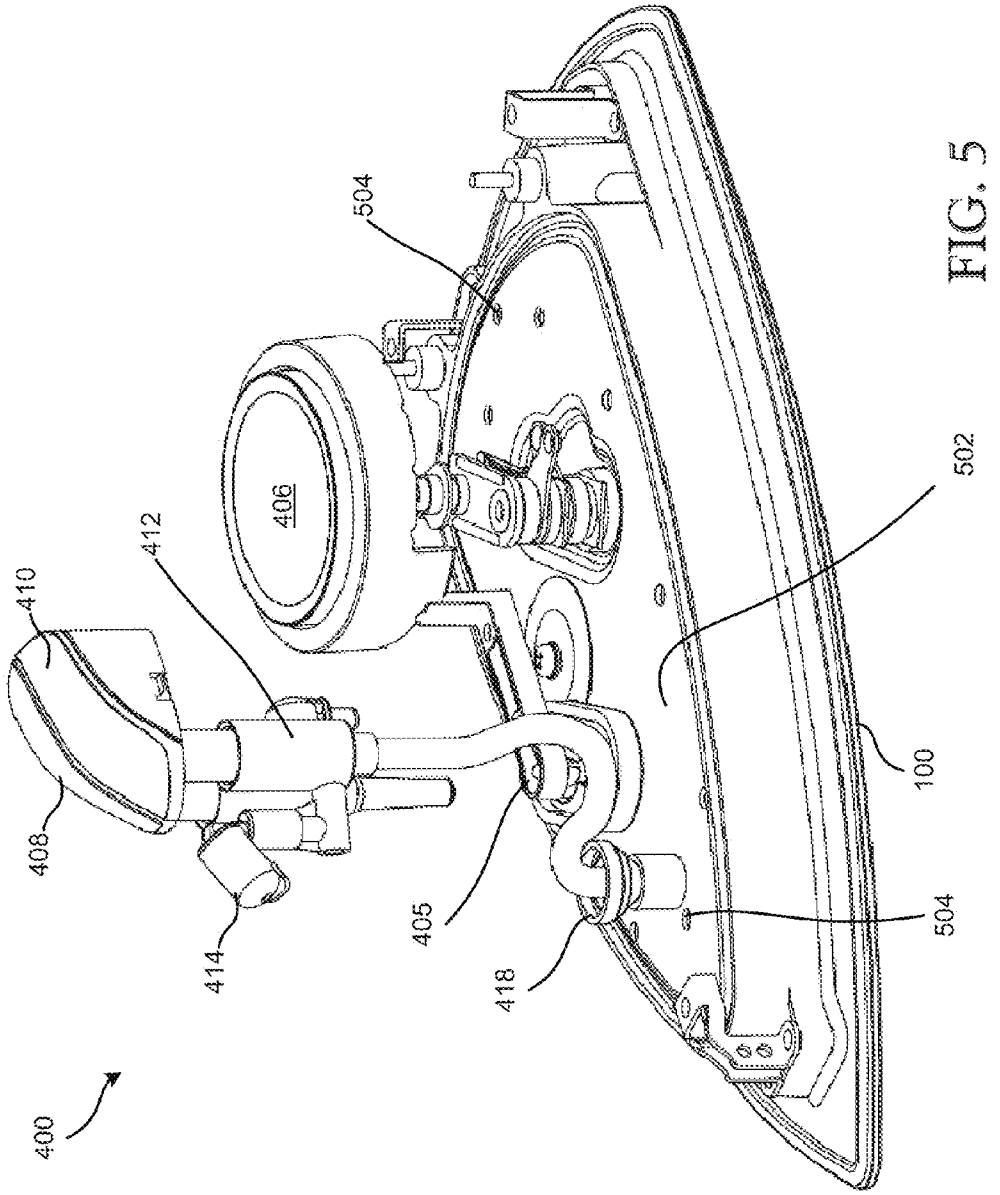


FIG. 5

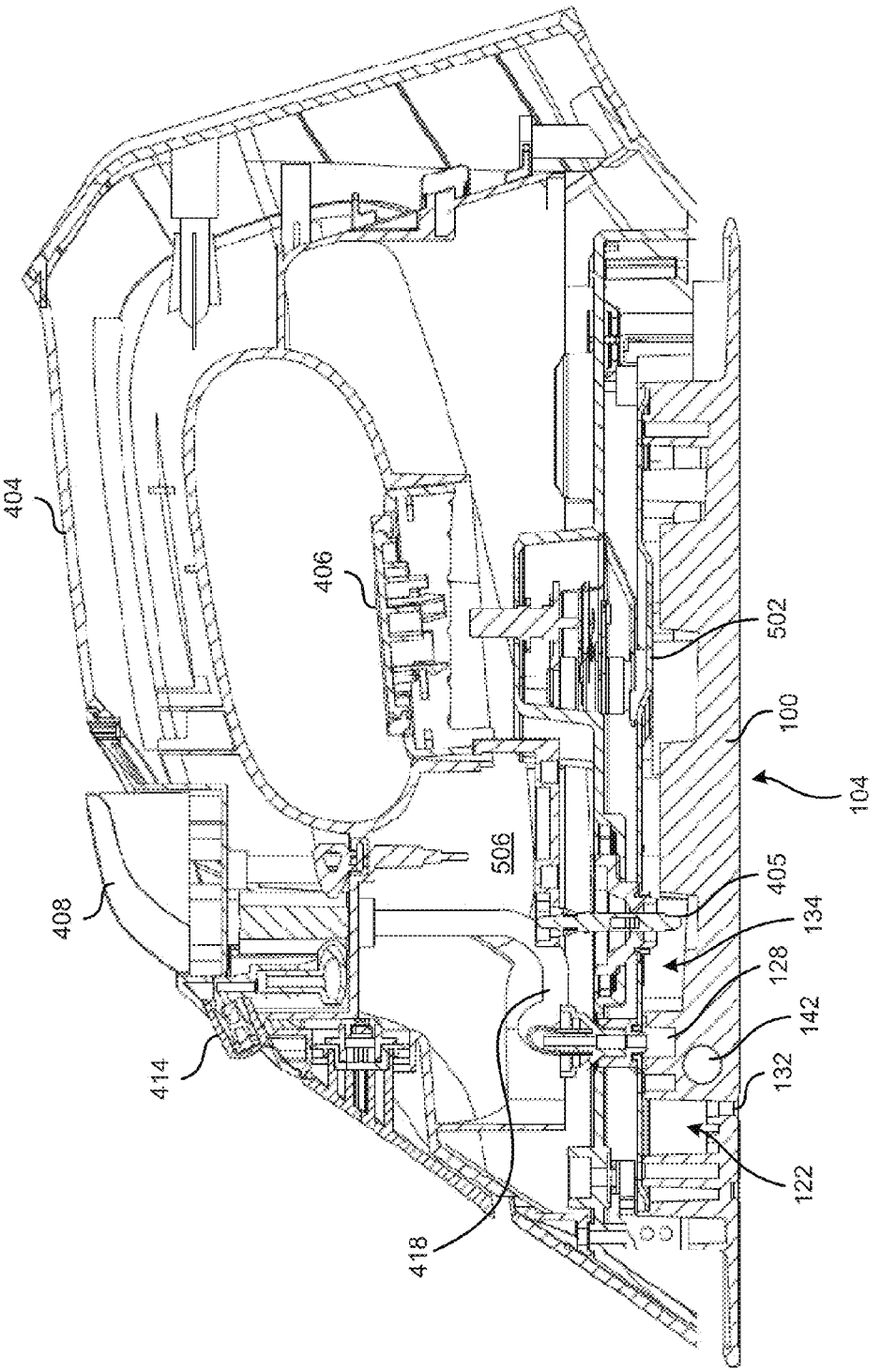


FIG. 6

STEAM IRON

CLAIM OF PRIORITY

[0001] The present patent application claims the priority benefit of the filing date of Australian Patent Application No. 2009902072, filed May 11, 2009, the entire content of which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to a steam iron, and in particular a steam iron operable to deliver a shot of steam.

BACKGROUND OF THE INVENTION

[0003] Irons for ironing clothes and other material are known.

[0004] At a basic level such irons include a heating arrangement for heating a soleplate which can be slid over the material being ironed to remove wrinkles and creases.

[0005] Steam irons include further componentry such that water is heated to steam and emitted from apertures in the soleplate while ironing. The steam emitted assists in the removal of wrinkles/creases from the material being ironed.

[0006] Some steam irons also allow a user to operate the iron to deliver a shot of steam, passing water vapour at greater pressure through the material being ironed, further assisting in the ironing process. A shot of steam is a conventionally activated by depressing a button on the iron which causes a charge of water to be heated to steam and emitted from the apertures in the soleplate (this may be in addition to the constant steam being emitted).

[0007] When using a steam shot function on a steam iron the user perception is often that a high-pressure shot of steam will be delivered at the front of the iron adjacent the tip of the soleplate. In many conventional irons, however, this is not the case. While steam is emitted from apertures in the soleplate at the front of the iron, the steam generation and delivery arrangement of the iron is such that the greatest steam pressure of a steam-shot is delivered through apertures in the rear of the iron soleplate, with the pressure decreasing towards the front of the iron.

[0008] It would be desirable to provide a steam iron adapted to emit a steam-shot of relatively high pressure from the front of an iron.

[0009] Reference to any prior art in the specification is not, and should not be taken as, an acknowledgment or any form of suggestion that this prior art forms part of the common general knowledge in Australia or any other jurisdiction or that this prior art could reasonably be expected to be ascertained, understood and regarded as relevant by a person skilled in the art.

SUMMARY OF THE INVENTION

[0010] In one aspect the present invention provides an electric steam iron including: a water reservoir; a soleplate including: a base; a heating element; a constant steam chamber in fluid communication with a plurality of constant steam chamber apertures passing through the base; a steam shot chamber including a front cavity and a steam shot channel in thermal communication with the heating element and in fluid communication with the front cavity, the front cavity including at least one steam shot chamber aperture passing through the base, the steam shot channel defining at least one re-entrant flow path substantially overlying the heating element; the iron further including a constant steam chamber water delivery means for delivering water from the water reservoir into the constant steam chamber; and a steam shot chamber water delivery means for delivering water from the water reservoir into the steam shot chamber in the soleplate.

[0011] The total length of the steam shot channel is preferably longer than the length of the heating element, and may be at least twice the length of the heating element.

[0012] The soleplate may be of unitary construction.

[0013] The iron may include a pair of flow paths, each flow path having a re-entrant shape.

[0014] The pair of re-entrant flow paths may be symmetrical and meet at a confluence, and wherein the steam shot chamber water delivery means deposits water from the water reservoir into the confluence, the flow of the delivered water being split by a flow splitter so as to be divided between the flow paths.

[0015] The constant steam chamber may include a central cavity in fluid communication with a pair of lateral channels in which the constant steam chamber apertures are located, the central cavity adapted to receive water from the constant steam chamber water delivery means and vent the received water as steam from the constant steam chamber apertures.

[0016] The central cavity and lateral channels of the constant steam chamber and the steam shot channel and front cavity of the steam shot chamber may be defined by one or more walls extending normally from the soleplate.

[0017] The iron may further include a soleplate cover adapted to seal the constant steam chamber and the steam shot chamber.

[0018] The soleplate cover may include a first aperture through which the constant steam chamber water delivery means passes, and a second aperture through which through which the steam shot chamber water delivery means passes.

[0019] The steam shot chamber may be in fluid isolation from the constant steam chamber.

[0020] The steam shot chamber water delivery means may include a pump operable by a user to deliver water from the water reservoir to the steam shot chamber.

[0021] The constant steam chamber water delivery means may include a constant flow-rate valve for delivering water from the water reservoir to the constant steam chamber at a predefined rate, the water delivered to the constant steam chamber vented as steam from the constant steam chamber apertures to provide a constant steam flow.

[0022] In a second aspect the present invention provides an electric steam iron including: a water reservoir; a soleplate, the soleplate being of unitary construction and including: a base; a heating element; a constant steam chamber in fluid communication with a plurality of constant steam chamber apertures passing through the base; a steam shot chamber including a front cavity and a steam shot channel in thermal communication with the heating element and in fluid communication with the front cavity, the front cavity including at least one steam shot chamber aperture passing through the base, the steam shot channel defining at least one flow path substantially overlying the heating element, the at least one flow path having a re-entrant shape; the iron further including a constant steam chamber water delivery means for delivering water from the water reservoir into the constant steam chamber; and a steam shot chamber water delivery means for delivering water from the water reservoir into the steam shot chamber in the soleplate.

[0023] The total length of the at least one flow path may be greater than the length of the heating element.

[0024] The at least one flow path may include a pair of flow paths, each flow path in the pair of flow paths substantially overlying the heating element, and each flow path in the pair of flow paths having a re-entrant shape.

[0025] In a third aspect the present invention provides an electric steam iron including: a water reservoir; a soleplate including: a base; a heating element; a constant steam chamber in fluid communication with a plurality of constant steam chamber apertures passing through the base; a steam shot chamber including a front cavity and a steam shot channel in thermal communication with the heating element and in fluid communication with the front cavity, the front cavity including at least one steam shot chamber aperture passing through the base, the steam shot channel defining at least one flow path substantially overlying the heating element, the at least one flow path having a re-entrant shape, the total length of the at least one flow path being greater than the length of the heating element; the iron further including a constant steam chamber water delivery means for delivering water from the water reservoir into the constant steam chamber; and a steam shot chamber water delivery means for delivering water from the water reservoir into the steam shot chamber in the soleplate.

[0026] The at least one flow path may include a pair of flow paths, each flow path in the pair of flow paths substantially overlying the heating element, and each flow path in the pair of flow paths having a re-entrant shape.

[0027] The soleplate may be of unitary construction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] An embodiment of the invention will be described with reference to the accompanying figures in which:

[0029] FIG. **1**A shows a plan view of an iron soleplate in accordance with an embodiment of the invention;

[0030] FIG. **1**B shows a partial diagrammatic view of the walls of the soleplate of FIG. **1**A, and the cavities and channels defined thereby.

[0031] FIG. **1**C shows the iron soleplate of FIG. **1**A with the element illustrated;

[0032] FIG. **2** shows a perspective view of the soleplate of FIG. **1**A;

[0033] FIG. **3** shows a bottom view of the soleplate of FIG. **1**A;

[0034] FIG. **4** shows a partial perspective view of an iron fitted with the soleplate depicted in FIG. **1**A;

[0035] FIG. **5** shows a partial perspective view of the iron of FIG. **4** with a cover fitted to the soleplate;

[0036] FIG. **6** shows a sectional elevation view of the iron of FIG. **4**.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0037] FIGS. **1** to **3** respectively provide a plan view, a perspective view, and a bottom view of a soleplate **100** in accordance with an embodiment of the invention. The soleplate **100** is for use with a steam iron which (as described in more detail below) can be operated to provide constant steam as well as a shot of steam.

[0038] In the preferred embodiment the soleplate **100** is a single, integral Die casting. By providing a unitary soleplate **100** the complexities of soleplate assembly are minimised, facilitating a cost effective steam iron construction. The soleplate **100** will typically be cast from an aluminium alloy.

[0039] The soleplate **100** includes a base portion **102** which has an underside surface **104** for ironing. As is known in the art the base portion **102** may be provided with a non-stick/low friction coating such as Teflon by DuPont, or a synthetic fluoropolymer such as polytetrafluoroethylene or polytetrafluoroethene (PTFE). The low friction coating allows the soleplate base to slide easily over the material being ironed. Alternatively, the base portion **102** may not be provided with a coating and, for example, the aluminium alloy (or other construction material) may simply be polished.

[0040] On the upper side **106** of the base an outer wall **108**, a middle wall **110**, an intermediate wall **112**, an inner wall **113** (joined to the middle wall **110**), and two bridging walls **114** (extending between the outer and middle walls **108** and **110** towards the front of the soleplate **100**) are formed. Walls **108** to **114** each extend normally from the base portion **102**. While walls **108** to **114** are, for the purposes of illustration, described as separate features, the soleplate **100** of the preferred embodiment is (as noted above) of unitary construction and as such the outer, middle, intermediate, inner and bridging walls **108** to **114** are not in fact separate components but part of a single casting.

[0041] As can be seen, the outer wall **108** forms a closed loop defining an inner chamber **116** in which the middle wall **110**, intermediate wall **112**, inner wall **113**, and bridging walls **114** are located. The middle wall **110**, inner wall **113** and the bridging walls **114** serve to separate the inner chamber **116** into a forward steam shot chamber **118** used in the generation of a steam shot and a rear constant steam chamber **120** used in the generation of constant steam. When assembled into an iron the forward and rear chambers **118** and **120** are in fluid isolation from each other and, as described below, the steam shot chamber **118** is used for providing a shot of steam and the constant steam chamber **120** for providing constant steam.

[0042] FIG. **1**B shows a partial diagrammatic view of the walls (**108**, **110**, **112**, **113**, and **114**) and the channels (**123** and **136**) and cavities (**122** and **134**) defined by the soleplate of FIG. **1**A. The dotted arrows in FIG. **1**B indicate the direction of flow of steam.

[0043] The steam shot chamber **118** is divided into a front cavity **122** and a steam shot channel **123**. As can be seen, the middle, intermediate and inner walls **110**, **112** and **113** define the steam shot channel **123** to be effectively two re-entrant flow paths **126** joined at a confluence **128**, each flow path **126** feeding into the front cavity **122** at a channel opening **130**. The middle, intermediate and inner walls **110**, **112** and **113** are each provided with offset protrusions **127** (not shown in FIG. **1**B) which protrude into the re-entrant flow paths **126** and reduce the volume of the flowpaths **126**, thereby increasing pressure build-up in the flowpaths **126**.

[0044] The front cavity is provided with a number of steam shot chamber apertures **132** (not shown in FIG. **1**B) extending through the base portion **102** of the soleplate **100**. In the embodiment illustrated five steam shot chamber apertures **132** are depicted, however more or fewer could be provided as desired.

[0045] The constant steam chamber **120** is divided into a central cavity **134** and a pair of lateral channels **136**. The central cavity **134** is in fluid communication with the lateral channels **136**, the lateral channels **136** extending between the outer wall **108** and the middle wall **110** and terminating at the

relevant bridging wall **114**. The central cavity **134** is provided with a number of vanes **138** extending normally from the base portion **102** which, in use, assist in dividing water/steam between the two lateral channels **136** and act to draw water up the vanes **138** to aid the conversion of the water to steam. Each of the lateral channels **136** is provided with a number of constant steam chamber apertures **140** (not shown in FIG. 1B) extending through the base portion **102** of the soleplate **100**.

[0046] The soleplate **100** also carries a heating element **142** which is cast into position in the soleplate **100** at the time of manufacture. The heating element **142** is a sheath type heating element in which a coiled resistance wire extends through a protective tubular sheath and is insulated therefrom by a compound such as granulated and compressed magnesium oxide. Alternative heating elements could be used if desired. The heating element **142** includes a pair of terminals **144** which (when the soleplate **100** is assembled into an iron) connect with a power source of the iron.

[0047] In FIG. 1C, the outline of the heating element **142** is shown, and as can be seen the heating element **142** is essentially U-shaped. Each arm of the heating element **142** extends below the re-entrant flow paths **126** of the steam shot channel **123**, with the U-bend of the heating element **142** proximate the confluence **128** of the steam shot channel **123**. As can be seen, the each of the re-entrant flow paths **126** doubles-back over the element **142**, allowing steam passing through the steam shot channel **123** to remain in close proximity to (and be heated by) the element **142** for a far larger distance than would be the case if non-re-entrant flow paths were used. This, in turn, allows the element **142** to heat the steam in the steam shot channel **123** for a longer period of time, thereby increasing the pressure of the steam shot eventually delivered. In one embodiment, the total length of the steam shot channel **123** (i.e. the combined length of the re-entrant flow paths **126**) is longer than the length of the element **142**.

[0048] The soleplate **100** is also provided with a plurality of mounting bores **148** by which an iron incorporating the soleplate **100** can be assembled. Some of the mounting bores **148** are provided in the walls **108** to **114** and some extend from the base portion **102** of the soleplate **100** as stand-alone bores. The bores **148** may be threaded for receiving screws or similar, or may be adapted to receive fabricated metal brackets which facilitate the mounting of moulded covers.

[0049] The soleplate **100** may be provided with additional or alternative features depending on the particular arrangement of the iron with which the soleplate **100** is to be used. By way of example, the illustrated soleplate **100** includes a dial mount **150** which may be used (as shown in FIG. **4**) to mount a rotary mechanical thermostat by which a user operates the iron. The illustrated soleplate **100** also includes a disc mount **152** to which a bi-metallic disc may be secured to facilitate operation of an anti-drip valve assembly, preventing premature flow of water into the constant steam chamber **120** before the appropriate temperature is reached.

[0050] Turning to FIGS. **4** to **6**, partial depictions of an iron **400** including a soleplate **100** are provided. For the purpose of illustration the body **402** of the iron **400** has been depicted as being transparent, and not all components of the iron **400** are shown.

[0051] Those components of the iron **400** illustrated include a handle **404** defined in the upper portion of the body **402** and a control dial **406** housed in the body **402** below the handle **404**. As is known the control dial **406** may be used by a user to set the iron temperature and/or mode of operation of the iron. At the front of the handle **404** a pair of triggers **408** and **410** are provided which operate (in this instance) a mechanical pump assembly **412**. Depressing one of the triggers (e.g. the left trigger **410**) provides a spray mist to be generated via the nozzle **414**, and depressing the other trigger (e.g. right trigger **408**) provides a shot of steam as discussed further below.

[0052] In addition to the components of the iron **400** illustrated, the iron also includes a power source and cord (which exits the iron from cable guide **416**) for providing power to the iron.

[0053] As shown in FIG. **5**, when iron **400** is assembled the top of the soleplate **100** (i.e. the tops of walls **108** to **114**) is provided with a cover **502** which serves to seal the soleplate **100** (and in particular the inner chamber **116**) from a water reservoir **506** that is defined within the body **402** of the iron. The cover is provided with a plurality of securing apertures **504** which align with a selection of the bores **148** to allow the cover **502** (and iron body/componentry) to be secured in place—e.g. with screws. The cover **502** is also provided with a number of component apertures through which necessary components (described below) pass without allowing water from the water reservoir to leak into the inner chamber **116** or, conversely, water/steam in the inner chamber **116** to escape through the cover **502**.

[0054] In one mode of operation the iron **400** is configured to provide a constant outlet of steam through the constant steam chamber apertures **140**. This is achieved by a drip valve **405** (or similar) which passes through the cover **502** and allows a regulated flow of water from the water reservoir **506** to the constant steam chamber **120**. The specific regulated flow rate for the drip valve will depend on the size and construction of the iron and the desired volume of constant steam to be emitted. In one embodiment the flow rate may, for example, be approximately 30 millilitres/minute. In an alternative embodiment the flow rate may be approximately 35 millilitres/minute. In a further alternative embodiment the flow rate may be approximately 40 millilitres/minute. Still further alternative flow rates, either within or outside the range of 30-40 millilitres/minute, may, of course, be implemented.

[0055] The drip valve deposits water into the central cavity **134** of the constant steam chamber **120** where it is heated by heat from the heating element **142** (either directly or transferred through the soleplate **100**) to generate steam. As pressure in the central cavity **134** builds up the steam is directed into the lateral channels **136** (via vanes **138**) where it exits the iron **400** via the constant steam chamber apertures **140**. In addition to providing constant steam, the iron **400** may also be operated to generate a shot of steam through the steam shot chamber apertures **132**. To generate the shot of steam an amount of water from the water reservoir **506** is delivered to the steam shot channel **123**, and in particular to the confluence **128** of the steam shot channel **123**. In the illustrated embodiment this is achieved by the user depressing the steam-shot trigger (e.g. **408**) which operates the pump **412** to pump water from the water reservoir and deposit it in the steam shot channel **123** (via a conduit **418** which passes through the soleplate cover **502**). The specific volume of water to be deposited in the steam channel **123** will depend on a number of factors, including the desired volume of steam to be emitted in a single steam shot. In one embodiment the volume for a single shot of steam may be approximately 0.5 millilitres. In an alternative embodiment the volume for a single shot of

steam may be approximately 0.6 millilitres. Further alternative volumes, either within or outside the range of 0.5 to 0.6 millilitres may, of course, be used.

[0056] As noted above, the confluence **128** of the steam shot channel **123** (i.e. the point at which water from the water reservoir **506** is delivered) and the re-entrant flow paths **126** substantially overlay the heating element **142**. When water is delivered to the confluence **128** where it is heated to steam, the flow of the steam being divided between the re-entrant flow paths **126** (the bend in the inner wall **113** acting as a flow-splitter). The re-entrant shape of the flow paths **126** provides for a relatively long flow path, and as the entire length is in close proximity to the heating element **142** the water is quickly boiled to steam, and the pressure of the steam increased. The steam eventually exits the re-entrant flow paths **126** into the front cavity **122**, and from there is "shot" (by virtue of the pressure) out the steam shot chamber apertures **132**.

[0057] It will be understood that the invention disclosed and defined in this specification extends to all alternative combinations of two or more of the individual features mentioned or evident from the text or drawings. All of these different combinations constitute various alternative aspects of the invention.

What is claimed is:

1. An electric steam iron comprising:
- a water reservoir;
- a soleplate including:
  - a base;
  - a heating element;
  - a constant steam chamber in fluid communication with a plurality of constant steam chamber apertures passing through the base;
  - a steam shot chamber including a front cavity and a steam shot channel in thermal communication with the heating element and in fluid communication with the front cavity, the front cavity including at least one steam shot chamber aperture passing through the base, the steam shot channel defining a pair of flow paths substantially overlying the heating element, each flow path having a re-entrant shape; the iron further including
- a constant steam chamber water delivery means for delivering water from the water reservoir into the constant steam chamber; and
- a steam shot chamber water delivery means for delivering water from the water reservoir into the steam shot chamber in the soleplate.

2. The iron according to claim **1**, wherein the soleplate is of unitary construction.

3. The iron according to claim **1**, wherein the total length of the steam shot channel is greater than the length of the heating element.

4. The iron according to claim **1**, wherein the total length the steam shot channel is over twice the length of the heating element.

5. The iron according to claim **1**, wherein the pair of re-entrant flow paths are symmetrical and meet at a confluence, and wherein the steam shot chamber water delivery means delivers water from the water reservoir into the confluence, the flow of the delivered water being split by a flow splitter so as to be divided between the pair of flow paths.

6. The iron according to claim **1**, wherein the constant steam chamber includes a central cavity in fluid communication with a pair of lateral channels in which the constant steam chamber apertures are located, the central cavity adapted to receive water from the constant steam chamber water delivery means and vent the received water as steam from the constant steam chamber apertures.

7. The iron according to claim **6**, wherein the central cavity and lateral channels of the constant steam chamber and the steam shot channel and front cavity of the steam shot chamber are defined by one or more walls extending normally from the soleplate.

8. The iron according to claim **1**, further including a soleplate cover adapted to seal the constant steam chamber and the steam shot chamber.

9. The iron according to claim **8**, wherein the soleplate cover includes a first aperture through which the constant steam chamber water delivery means passes, and a second aperture through which through which the steam shot chamber water delivery means passes.

10. The iron according to claim **1**, wherein the steam shot chamber is in fluid isolation from the constant steam chamber.

11. The iron according to claim **1**, wherein the steam shot chamber water delivery means includes a pump operable by a user to deliver water from the water reservoir to the steam shot chamber.

12. The iron according to claim **1**, wherein the constant steam chamber water delivery means includes a constant flow-rate valve for delivering water from the water reservoir to the constant steam chamber at a predefined rate, the water delivered to the constant steam chamber vented as steam from the constant steam chamber apertures to provide a constant steam flow.

13. An electric steam iron comprising:
- a water reservoir;
- a soleplate, the soleplate being of unitary construction and including:
  - a base;
  - a heating element;
  - a constant steam chamber in fluid communication with a plurality of constant steam chamber apertures passing through the base;
  - a steam shot chamber including a front cavity and a steam shot channel in thermal communication with the heating element and in fluid communication with the front cavity, the front cavity including at least one steam shot chamber aperture passing through the base, the steam shot channel defining at least one flow path substantially overlying the heating element, the at least one flow path having a re-entrant shape; the iron further including
- a constant steam chamber water delivery means for delivering water from the water reservoir into the constant steam chamber; and
- a steam shot chamber water delivery means for delivering water from the water reservoir into the steam shot chamber in the soleplate.

14. The electric steam iron according to claim **13**, wherein the total length of the at least one flow path is greater than the length of the heating element.

15. The electric steam iron according to claim **13**, wherein the at least one flow path includes a pair of flow paths, each flow path in the pair of flow paths substantially overlying the heating element, and each flow path in the pair of flow paths having a re-entrant shape.

16. An electric steam iron comprising:

a water reservoir;

a soleplate including:

a base;

a heating element;

a constant steam chamber in fluid communication with a plurality of constant steam chamber apertures passing through the base;

a steam shot chamber including a front cavity and a steam shot channel in thermal communication with the heating element and in fluid communication with the front cavity, the front cavity including at least one steam shot chamber aperture passing through the base, the steam shot channel defining at least one flow path substantially overlying the heating element, the at least one flow path having a re-entrant shape, the total length of the at least one flow path being greater than the length of the heating element; the iron further including

a constant steam chamber water delivery means for delivering water from the water reservoir into the constant steam chamber; and

a steam shot chamber water delivery means for delivering water from the water reservoir into the steam shot chamber in the soleplate.

17. The electric steam iron according to claim **16**, wherein the at least one flow path includes a pair of flow paths, each flow path in the pair of flow paths substantially overlying the heating element, and each flow path in the pair of flow paths having a re-entrant shape.

18. The electric steam iron according to claim **16**, wherein the soleplate is of unitary construction.

* * * * *