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(54) **IRONING**

(57) An ironing unit 4 for an inductive ironing system 2, the ironing unit 4 comprising an inductive heating element 8 for inducing heating of a conductive ironing board 6.

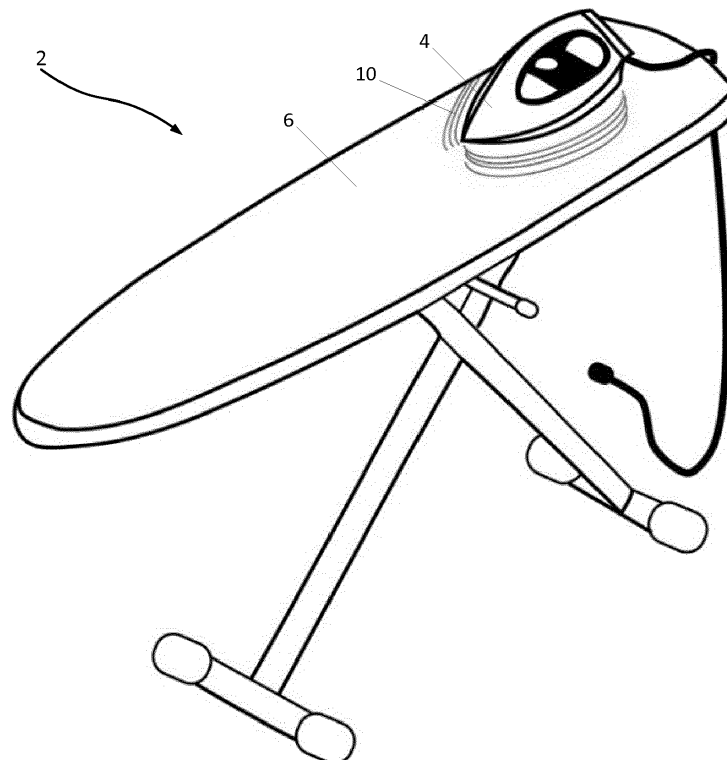


Figure 1

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Description

[0001] The present invention relates to an inductive ironing system. This invention also relates to an inverted ironing system.

[0002] A typical iron comprises a resistive heating element in an ironing unit that is moved across an ironing board. The iron can be hot enough to cause injury to a user and damage to objects, so care must be taken when using the iron. In order to provide power to the resistive heating element a power lead typically connects the iron to a power source. The power lead can interfere with handling of the iron, and if inadvertently pulled it can cause the iron to move and cause damage or injury. Cable-less irons that are known typically fail to provide comparable ironing performance compared to conventional irons.

[0003] It is an aim of the present invention to provide an improved ironing system which at least alleviates some of these problems.

Induction Iron

[0004] According to one aspect of the invention, there is provided an ironing unit for an inductive ironing system, the ironing unit comprising an inductive heating element for inducing heating of a conductive ironing board.

[0005] Due to the inductive nature of the heating, the ironing unit on its own does not heat up, and therefore the risk of injury and damage is reduced. The heating can be localised at the conductive ironing board, which is more robust and less likely to fall than an ironing unit. As the thermal mass of the ironing unit need not be large, it can be relatively lightweight and easy to handle. Inductive heating can enable fast and efficient heating. Inductive heating can enable the use of materials for the iron that are not suitable for conventional irons. The ironing unit may comprise a body for housing the inductive heating element and a connection to a power source for powering the inductive heating element.

[0006] For ease of manufacture the inductive heating element is preferably an inductive coil.

[0007] For safety the ironing unit may further comprise a switch for activating or deactivating the inductive heating element in dependence on an orientation of the ironing unit.

[0008] For convenience the switch is preferably arranged to activate the inductive heating element when a base plate of the ironing unit is in a horizontal orientation, and deactivate the inductive heating element when the base plate is not in a horizontal orientation.

[0009] For a smoothness and strength the base plate of the ironing unit may be of glass.

[0010] According to another aspect of the invention, there is provided an ironing board for an inductive ironing system comprising an ironing unit as aforesaid, wherein an ironing portion of the ironing board is conductive. This can enable inductive heating by the ironing unit.

[0011] As preferably used herein, a material may be considered to be conductive if it has an electrical resistivity ρ smaller than $1 \Omega \cdot m$, and more preferably smaller than $0.001 \Omega \cdot m$,

5 [0012] For strength and cost efficiency the ironing portion is preferably metallic. For efficient inductive heating the ironing portion may comprise a ferromagnetic material.

10 [0013] For localisation of heating the ironing portion may be divided into portions of conductive areas.

[0014] According to another aspect of the invention, there is provided a cover for use with an ironing unit as aforesaid, wherein an ironing portion of the cover is conductive. This can enable inductive heating by the ironing unit, regardless of the surface that is used for ironing. The cover may be a cover for an ironing board.

15 [0015] For strength and cost efficiency the cover may comprise a metallic material. For efficient inductive heating the cover may comprise a ferromagnetic material.

20 [0016] For ease of manufacture the cover may comprise a woven conductive material or a sheet conductive material.

[0017] For localisation of heating the ironing portion may be divided into portions of conductive areas.

25 [0018] According to another aspect of the invention, there is provided an inductive ironing system comprising: an ironing unit as aforesaid; and an ironing board as aforesaid or a cover as aforesaid.

30 [0019] According to another aspect of the invention, there is provided an inductive ironing system.

[0020] The invention extends to an ironing unit substantially as herein described and/or as illustrated with reference to Figures 1 and 2. The invention also extends to an ironing board substantially as herein described and/or as illustrated with reference to Figures 1 and 2. The invention also extends to a cover for an ironing board substantially as herein described and/or as illustrated with reference to Figures 1 and 2. The invention also extends to an inductive ironing system substantially as herein described and/or as illustrated with reference to Figures 1 and 2.

Ironless Iron

45 [0021] According to another aspect of the invention, there is provided an ironing board for an inverted ironing system, the ironing board comprising a shuttle adapted to provide heat at an ironing surface of the ironing board, wherein the shuttle is adapted to move with respect to the ironing board.

50 [0022] Preferably the shuttle moving with respect to the ironing board comprises moving within the ironing board.

[0023] For efficient heat provision the shuttle is preferably adapted to move within the ironing board and preferably in the plane of the ironing surface of the ironing board.

55 [0024] To enable localisation of the heating the ironing

board preferably further comprises tracking means for the shuttle to track an object adjacent the ironing surface.

[0025] For reliable tracking the tracking means may comprise a detector arranged to determine a location of an ironing unit at the ironing surface. For reliable tracking the shuttle is preferably adapted to move to the determined location. For efficient tracking the detector may comprise an RFID sensor.

[0026] For robust movement and cost efficiency one or more cables may be arranged between the shuttle and the ironing board to actuate movement of the shuttle within the ironing board.

[0027] For user convenience one or more actuator may be arranged to draw in one or more cables to actuate movement of the shuttle within the ironing board.

[0028] For simplicity and sufficient freedom of movement three cables may be arranged to pull the shuttle in three different directions.

[0029] For good ironing performance the shuttle may further be adapted to provide steam at the ironing surface.

[0030] For good ironing performance the shuttle may further be adapted to provide a force to textiles adjacent the ironing surface.

[0031] For reliability and simplicity the shuttle may comprise a magnetic unit for attracting an external magnet and thereby providing a force to textiles adjacent the ironing surface.

[0032] For convenience the ironing board may further comprise a generator adapted to provide heat to the shuttle. For shuttle manoeuvrability the generator may be located remotely to the shuttle and connected by a connector (such as tubing) to the shuttle. For simplicity the generator may provide heated air to the shuttle. For minimal obstruction of the shuttle the generator may be arranged at an end portion of the ironing board and connected to the shuttle by a connector.

[0033] For fast and efficient heating the shuttle may comprise an inductive heating element for inducing heating of a conductive ironing unit.

[0034] For enhanced ironing performance the generator may be further adapted to provide steam to the shuttle. To enable extended ironing the ironing board may further comprise a water reservoir for the steam generator. For minimal obstruction of the shuttle the water reservoir is preferably arranged at an end portion of the ironing board.

[0035] For user convenience the shuttle may be adapted to release heat and/or optionally release steam and/or optionally apply a force in dependence on one or more control triggers. For user convenience the control triggers may relate to one or more of: a control signal controllable by a user; a proximity of an ironing unit; and a presence of textiles adjacent the ironing surface.

[0036] For ease of ironing the ironing board may further comprise suction means adapted to provide a partial vacuum at the ironing surface. This can also enable recycling of hot air and/or steam.

[0037] For compactness the ironing board may comprise a recess adapted to receive an ironing unit.

[0038] According to another aspect of the invention, there is provided an ironing board for an inverted ironing system, the ironing board being adapted to provide heat at an ironing surface of the ironing board.

[0039] According to another aspect of the invention, there is provided an ironing unit for use with an ironing board according to aforesaid.

[0040] Because the shuttle as aforesaid can provide heat and steam and/or pressure, the ironing unit need not provide heat or steam or pressure, and so can be lightweight and manoeuvrable. Also the risk of injury or damage from the ironing unit can be reduced. Because the ironing unit need not provide heat or steam no cable or power lead is required at the ironing unit and inconvenience associated with a power lead can be avoided.

[0041] For user convenience the ironing unit may comprise a foot and a handle.

[0042] For user convenience the ironing unit may further comprise a control means for providing a control signal controllable by a user and controlling release of heat and/or optionally release of steam and/or optionally application of a force.

[0043] For ease of tracking the ironing unit may further comprise a transmitter arranged to indicate the location of the ironing unit to an ironing board. For ease of identification the transmitter may comprise an RFID unit.

[0044] For enhanced ironing performance the ironing unit may further comprise a magnetic unit for attracting an external magnet and thereby providing a force to textiles adjacent an ironing board.

[0045] For enhanced functionality the ironing unit may further comprising a data transfer module for wireless data transfer to/from an ironing board and/or to/from a data source.

[0046] For enhanced functionality the ironing unit may further comprise a display means for providing information in relation to ironing. For enhanced functionality the ironing unit may further comprise a processor adapted to obtain and provide information in relation to ironing.

[0047] According to another aspect of the invention, there is provided an inverted ironing system comprising an ironing board as aforesaid and an ironing unit as aforesaid.

[0048] For protection from escaping heat and steam the ironing unit is preferably dimensioned such that it overlaps the shuttle when aligned. The overlap may be at least 0.5 cm, and preferably between 1 cm and 3 cm.

[0049] According to another aspect of the invention, there is provided an inverted ironing system.

[0050] The invention extends to an ironing board substantially as herein described and/or as illustrated with reference to Figures 3 to 10. The invention also extends to an ironing unit substantially as herein described and/or as illustrated with reference to Figures 3 to 10. The invention also extends to an inverted ironing system substantially as herein described and/or as illustrated with

reference to Figures 3 to 10.

[0051] Any apparatus feature as described herein may also be provided as a method feature, and vice versa. As used herein, means plus function features may be expressed alternatively in terms of their corresponding structure.

[0052] Any feature in one aspect of the invention may be applied to other aspects of the invention, in any appropriate combination. In particular, method aspects may be applied to apparatus aspects, and vice versa. Furthermore, any, some and/or all features in one aspect can be applied to any, some and/or all features in any other aspect, in any appropriate combination.

[0053] It should also be appreciated that particular combinations of the various features described and defined in any aspects of the invention can be implemented and/or supplied and/or used independently.

[0054] These and other aspects of the present invention will become apparent from the following exemplary embodiments that are described with reference to the following figures in which:

Figure 1 shows an inductive ironing system;
 Figure 2 shows an inductive ironing unit;
 Figure 3 is a perspective view of an inverted ironing system;
 Figure 4 is a plan view of the ironing system of Figure 3;
 Figure 5 is a sectional plan view of the ironing board of Figure 3;
 Figure 6 is a side view of the ironing system of Figure 3;
 Figure 7 is a perspective view of the ironing system of Figure 3 with the ironing board shown partially transparent;
 Figure 8 is an enlarged sectional side view of the ironing system of Figure 3;
 Figure 9 is an enlarged view of the ironing unit of Figure 3; and
 Figure 10 is a perspective view of the ironing system of Figure 3 in a resting configuration.

Induction Iron

[0055] Figure 1 shows an inductive ironing system 2 with an inductive ironing unit 4. Figure 2 shows an inductive ironing unit 4 in more detail. The inductive ironing system 2 is based on induction technology. The inductive ironing system comprises an ironing unit 4 and an ironing board 6. The ironing unit 4 comprises an in-built induction coil 8, which induces heat when comes in the proximity of a suitable ironing board 4. The material of the ironing board 4 is conductive and compatible with induction technology. When cloth is placed between the ironing unit 4 and ironing board 6, heat is generated at the proximal area of iron and ironing board, which is called a heat zone 10. As the ironing unit 4 is moved across the ironing board 6 the heat zone 10 moves. The heat is also spread around

the heat zone 10 region due to heat conduction in the ironing board 6. Heat conduction from the ironing board 6 to the ironing unit 4 also occurs. By keeping the thermal mass of the ironing board 6 and the ironing unit 4 small the heat stored in these can be kept small and quick cooling can be achieved when the ironing unit 4 is removed from the ironing board 6.

[0056] The ironing unit 4 on its own does not heat up; it generates heat only when it comes in proximity to a conductive material. As the ironing unit 4 does not heat up unless in proximity to the ironing board 6, accidents such as burning carpets or furniture can be avoided. The risks associated with forgetting an iron and leaving it unintended are reduced. The danger of burns to a user is reduced. The ironing unit 4 can be relatively small, lightweight and cost efficient, as the induction coil need not be particularly large. Fast and efficient heating of the cloth can be enabled. The base plate 12 of an ironing unit 4 can be glass, which can enable particularly smooth movement of the ironing unit 4 over cloth.

[0057] For inductive heating a conductive material is provided on or in the ironing board 6. In an example of a suitable ironing board 6 a metal (or otherwise conductive) ironing board is provided. For example, a ferromagnetic material may be embedded in the ironing portion of the ironing board in strips or in patches or in a continuous area. Ferromagnetic material can provide particularly effective heating under the influence of an inductive coil. The ferromagnetic material may be presented at the surface of the ironing board, or may be concealed beneath a covering material for protection against wear and damage.

[0058] In an alternative a conventional non-metallic ironing board is provided with a flexible cover made of metallic or otherwise conductive fibres; in this example the cover is fitted over the non-metallic ironing board. The woven metallic fibre cover can be placed over any surface, not just over an ironing board, such that any surface can be used as an ironing board. The cover can be foldable and/or rollable for ease of transport and storage, and thus the inconvenience of transporting or storing a conventional ironing board can be avoided.

[0059] In an alternative the conductive material of the ironing board 6 is divided into portions such that the spreading of heat around the heat zone 10 by conduction is limited. This can avoid excessive spreading of heat in the ironing board 6.

[0060] In an alternative a switch is included in the ironing unit 4 such that the induction coil 8 is only active when the base plate 12 of the ironing unit 4 is in a particular orientation, such as horizontal. This can help avoid inadvertent heating of metallic objects near the ironing unit 4 in between use.

Ironless Iron

[0061] Figures 3 to 10 show different views of an inverted ironing system 102. In the inverted ironing system

102 heat, steam and pressure are provided from an ironing board 106. An ironing unit 104 is provided for directing the application of the heat, steam and pressure.

[0062] Heat (for example in the form of hot air) and optionally steam are delivered to textiles on the ironing board 106 from within the ironing board 106 instead of via an iron. The heat and steam is only applied where the ironing unit 104 is located. This can enable a user to direct the application of the heat and steam, and also ensure that the user is not inadvertently burned.

[0063] Figure 5 shows an example of the interior of an ironing board 106 adapted for the inverted ironing system 102. A shell 118 defines a space within which a shuttle 110 moves beneath the ironing surface 120. The ironing surface 120 can be any surface that allows the shuttle 110 to be able to track the ironing unit 104, allows heat and steam to pass freely, acts as a cushion to provide support between the board and the clothes, and is fast drying and/or water resistant. The ironing surface 120 may be a metal mesh, a plastic frame or any porous surface or membrane. The shuttle 110 includes a heat and steam outlet. The shuttle 110 is attached to the edge of the shell 118 by cables 118 that can be reeled in to produce movement of the shuttle 110 across the ironing surface 120. Alternative means of shuttle movement may be implemented.

[0064] The shuttle 110 is in communication with a heat and steam generator 114 via heat and steam tubing 112. The heat and steam generator 114 includes a water reservoir 116 for generating steam.

[0065] In use a user moves the ironing unit 104 over the ironing surface 120. The ironing unit 104 is tracked (for example via RFID or any other radio tracking or positioning device including electromagnetic and/or visual/optical motion-tracking systems such as Microsoft Kinect) by the shuttle 110 inside the shell 118 of the ironing board 106. Because the heat and steam is provided from the shuttle 110 (and not the ironing unit 104) the ironing unit 104 requires no connection to a power source or steam generator. Such a connection-free ironing unit 104 is more convenient for a user to move around.

[0066] The shuttle 110 is disc-shaped, as can be seen in Figure 5. The ironing unit 104 comprises a handle 105 and a teardrop-shaped foot 107, as can be seen in Figure 9. The round portion of the foot 107 is dimensioned with a larger diameter than the shuttle 110. When the shuttle 110 and the ironing unit 104 are aligned the ironing unit 104 can overlap the shuttle 110 in all directions, as can be seen in Figure 8, in order to protect a user from steam or hot air escaping from the shuttle 110. The overlap is for example at least 0.5 cm, and preferably between 1 cm and 3 cm in an example. The angular protruding portion of the foot 107 can assist with ironing in narrow or constricted portions of textiles.

[0067] In the illustrated example the heat and steam generator 114 including the water reservoir 116 is built into the ironing board 106. A conventional power lead can connect the heat and steam generator 114 to a power

source. By providing steam generating capability superior ironing can be enabled as compared to a conventional iron. A relatively large water reservoir 116 can be provided as it can be built into the ironing board 106, such that steam can be provided for a relatively long time before replenishing of the reservoir becomes necessary.

[0068] The ironing board 106 provides a recess 122 for receiving the ironing unit 104 when it is not in use.

[0069] The ironing unit 104 is comparatively lightweight, whereas a typical iron weighs approximately 1.75 kg. Because the ironing unit 104 is lightweight less lifting is required by the user. The ironing unit may be more manoeuvrable and easy to wield. In order to apply a similar force to textiles on the ironing surface 120 the ironing unit 104 may be magnetically attracted toward the shuttle 110 by suitable magnetic means.

[0070] In a variant a sensor determines whether the ironing unit 104 is positioned on the ironing surface 120, and heat and steam is only applied when the ironing unit 104 is placed on the ironing surface 120. In a variant a sensor determines whether textiles are positioned on the ironing surface 120, and heat and steam is only applied if textiles are placed on the ironing surface 120.

[0071] In a variant a control is provided in the ironing unit 110 to actuate release of heat, release of steam and/or application of pressure. This can enable a user for example to apply steam selectively to certain portions of a garment, or to switch a pressure on once the ironing unit 110 is satisfactorily positioned. The control may also be provided elsewhere than in the ironing unit 104.

[0072] In a variant connectivity options are provided. A screen or a mobile application can permit for example timing of ironing times, or show an optimal method of ironing specific clothes via, e.g., an electronic tutorial or video-based app.

[0073] In a variant means are included to create a partial vacuum at the ironing surface 120 so as to hold clothes in place on the ironing surface 120. This can provide the additional benefit of enabling capture of unused steam and/or hot air, potentially recirculating such unused steam and/or hot air for efficiency.

[0074] In a variant the shuttle comprises a resistive heating element to provide heat to the ironing surface 120, or alternatively an inductive coil to provide heat as described above.

[0075] It will be understood that the present invention has been described above purely by way of example, and modifications of detail can be made within the scope of the invention.

[0076] Each feature disclosed in the description, and (where appropriate) the claims and drawings may be provided independently or in any appropriate combination.

[0077] Reference numerals appearing in the claims are by way of illustration only and shall have no limiting effect on the scope of the claims.

Claims

Induction Iron

1. An ironing unit for an inductive ironing system, the ironing unit comprising an inductive heating element for inducing heating of a conductive ironing board. 5
2. An ironing unit as claimed in Claim 1, in which the inductive heating element is an inductive coil, and/or wherein a base plate of the unit is of glass. 10
3. An ironing unit according to Claim 1 or 2, further comprising a switch for activating or deactivating the inductive heating element in dependence on an orientation of the ironing unit, and preferably wherein the switch is arranged to activate the inductive heating element when a base plate of the ironing unit is in a horizontal orientation, and deactivate the inductive heating element when the base plate is not in a horizontal orientation. 15 20
4. An ironing board for use with an ironing unit according to Claim 1, 2 or 3, wherein an ironing portion of the ironing board is conductive, and preferably wherein the ironing portion is metallic, and more preferably wherein the ironing portion comprises a ferromagnetic material. 25
5. A cover for use with an ironing unit according to any of Claim 1, 2 or 3, wherein an ironing portion of the cover is conductive, and preferably wherein the cover comprises a metallic material, and more preferably a ferromagnetic material, and optionally wherein the cover comprises a woven conductive material or a sheet conductive material. 30 35
6. An ironing board as claimed in Claim 4, or a cover as claimed in Claim 5, wherein the ironing portion is divided into portions of conductive areas. 40

Ironless Iron

7. An ironing board for an inverted ironing system, the ironing board comprising a shuttle adapted to provide heat at an ironing surface of the ironing board, wherein the shuttle is adapted to move with respect to the ironing board. 45
8. An ironing board according to Claim 7, wherein the shuttle is adapted to move within the ironing board, and preferably in the plane of the ironing surface of the ironing board, and optionally wherein one or more cables are arranged between the shuttle and the ironing board to actuate movement of the shuttle within the ironing board, optionally with one or more actuators arranged to draw in the one or more cables to actuate movement of the shuttle within the ironing 50 55

board, and optionally wherein three cables are arranged to pull the shuttle in three different directions.

9. An ironing board according to Claim 7 or 8, further comprising tracking means for the shuttle to track an object adjacent the ironing surface, and preferably wherein the tracking means comprises a detector arranged to determine a location of an ironing unit at the ironing surface, and more preferably wherein the shuttle is adapted to move to the determined location, optionally wherein the detector comprises an RFID sensor.

10. An ironing board according to any of Claims 7 to 9, wherein the shuttle is further adapted to provide steam at the ironing surface.

11. An ironing board according to any of Claims 7 to 10, wherein the shuttle is further adapted to provide a force to textiles adjacent the ironing surface, and preferably wherein the shuttle comprises a magnetic unit for attracting an external magnet and thereby providing a force to textiles adjacent the ironing surface.

12. An ironing board according to any of Claims 7 to 11, further comprising a generator adapted to provide heat to the shuttle, and preferably wherein the generator is adapted to provide heat in the form of heated air and/or steam to the shuttle, optionally wherein the generator is arranged at an end portion of the ironing board and connected to the shuttle by a connector, and/or further comprises a water reservoir.

13. An ironing board according to any of Claims 7 to 12, further comprising suction means adapted to provide a partial vacuum at the ironing surface.

14. An ironing board according to any of Claims 7 to 13, wherein the shuttle comprises an inductive heating element for inducing heating of a conductive ironing unit, and preferably wherein the shuttle is adapted to release heat and/or optionally apply a force in dependence on one or more control triggers, optionally wherein the control triggers relate to one or more of: a control signal controllable by a user; a proximity of an ironing unit; and a presence of textiles adjacent the ironing surface.

15. An ironing unit for use with an ironing board according to any of Claims 7 to 14, and preferably comprising a foot and a handle, and more preferably further comprising a transmitter such as an RFID unit arranged to indicate the location of the ironing unit to an ironing board.

16. An ironing unit as claimed in Claim 15, further

comprising a magnetic unit for attracting an external magnet and thereby providing a force to textiles adjacent an ironing board.

17. An ironing unit as claimed in Claim 15 or 16, 5
further comprising a control means for providing a control signal controllable by a user and controlling release of heat and/or optionally release of steam and/or optionally application of a force, and optionally further comprising a data transfer module for 10
wireless data transfer to/from an ironing board and/or to/from a data source, and/or a processor adapted to obtain and provide information in relation to ironing, and/or a display means for providing information in relation to ironing. 15

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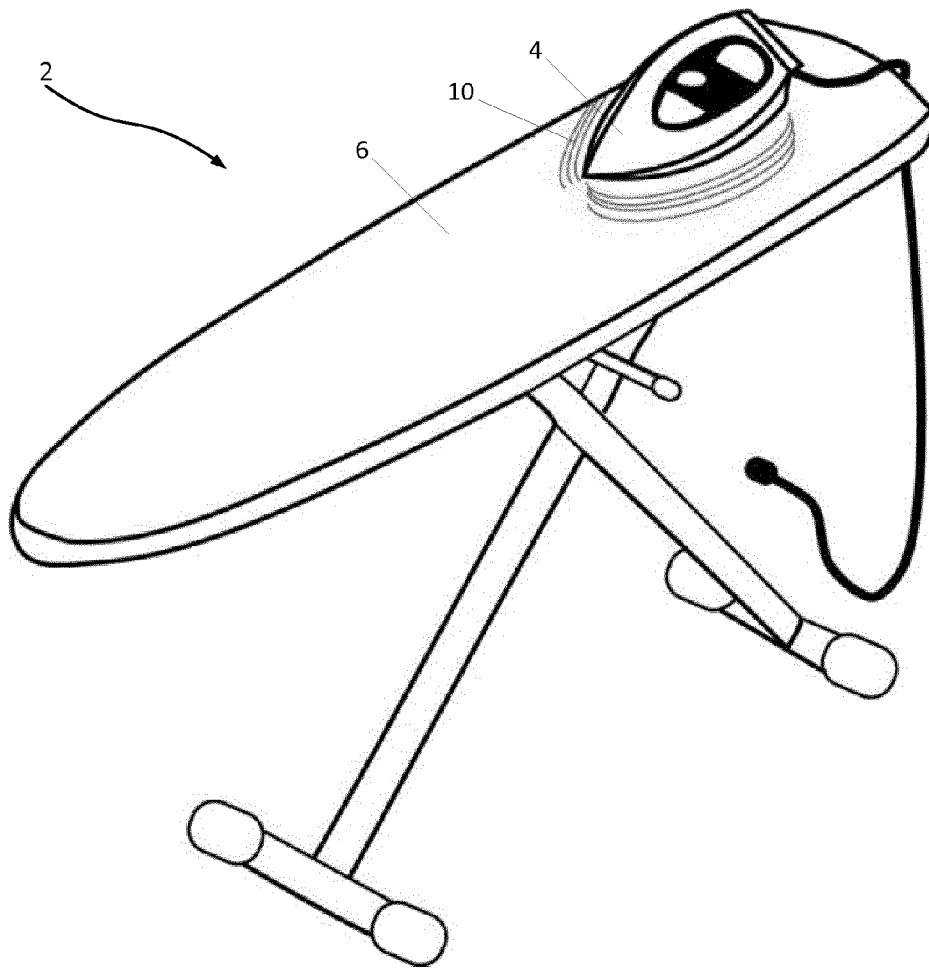


Figure 1

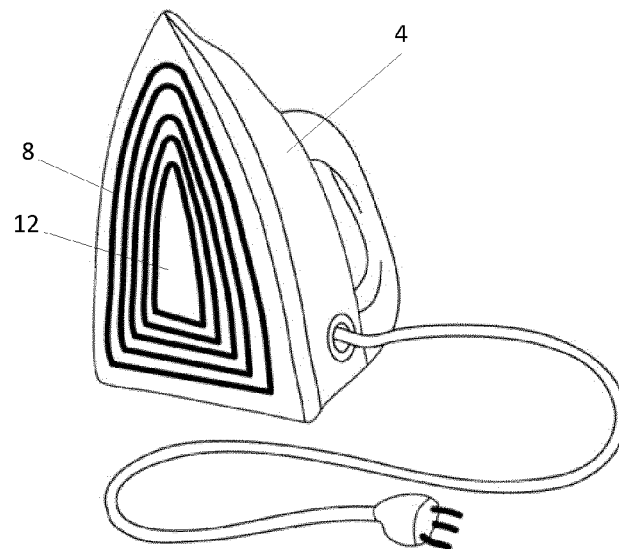


Figure 2

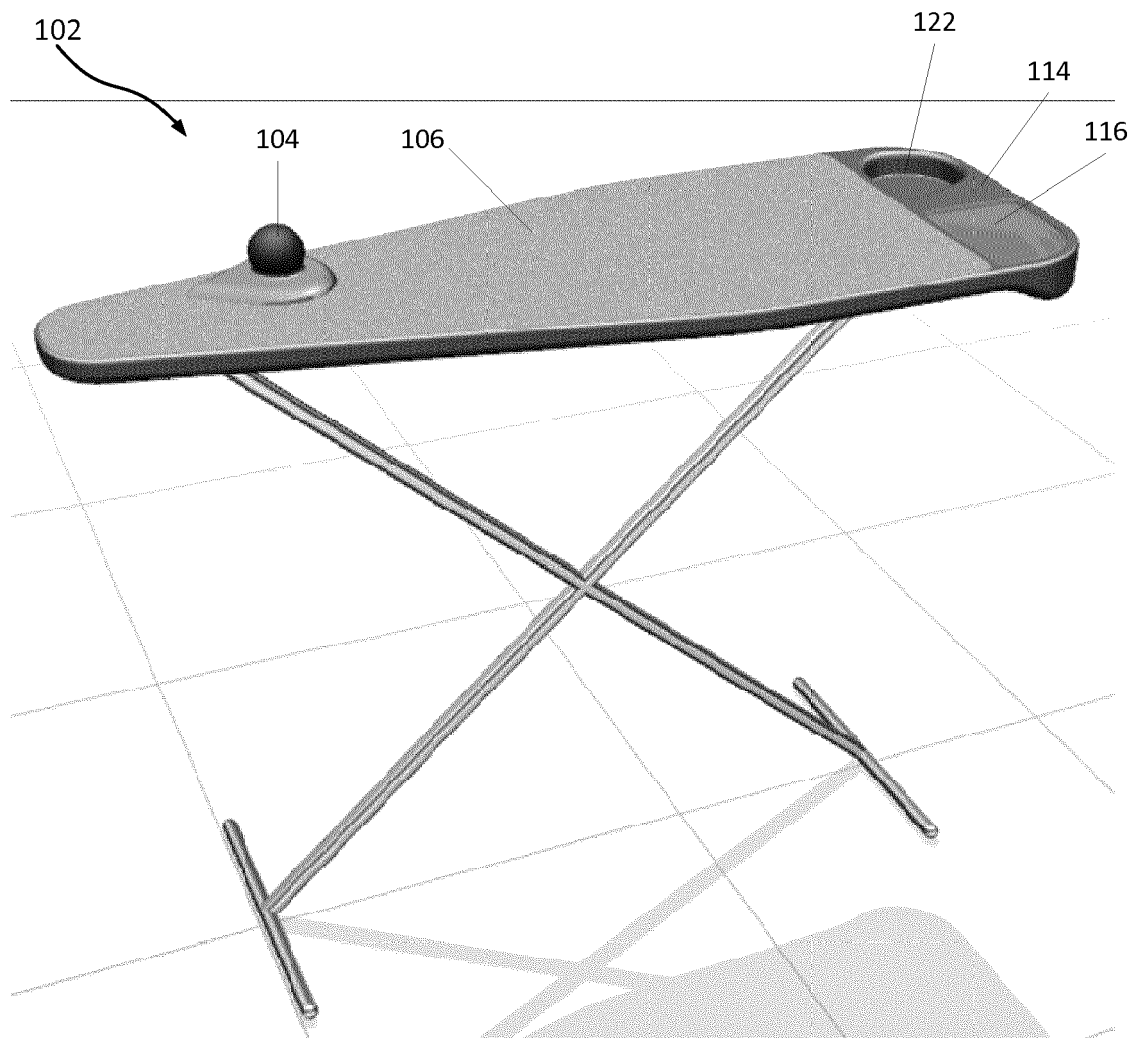


Figure 3

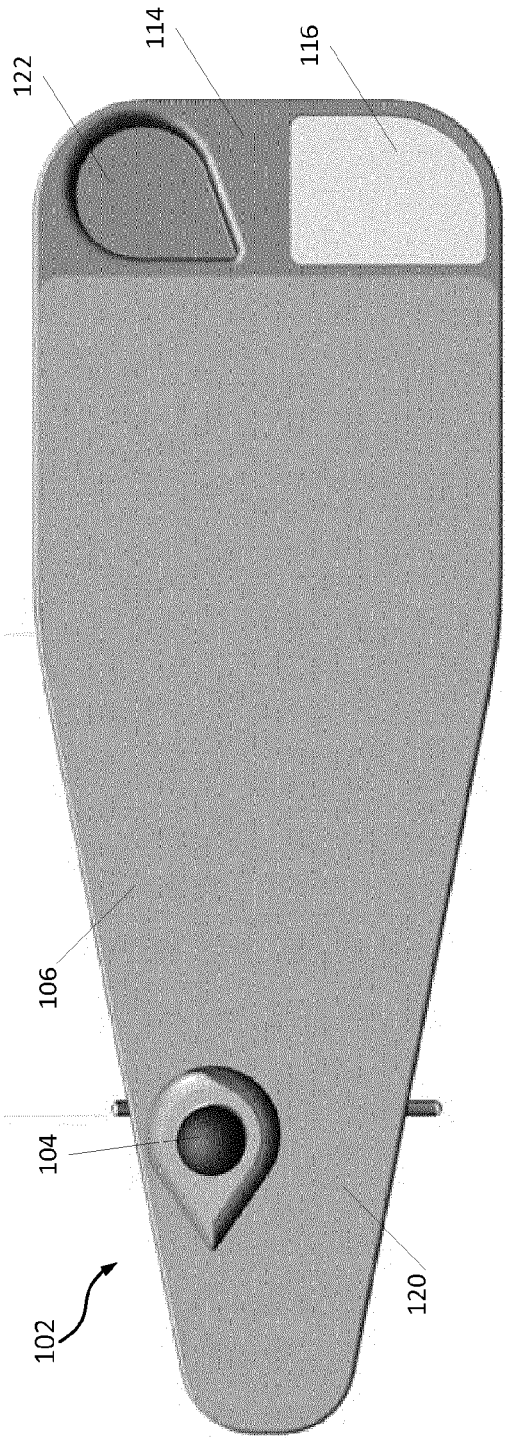


Figure 4

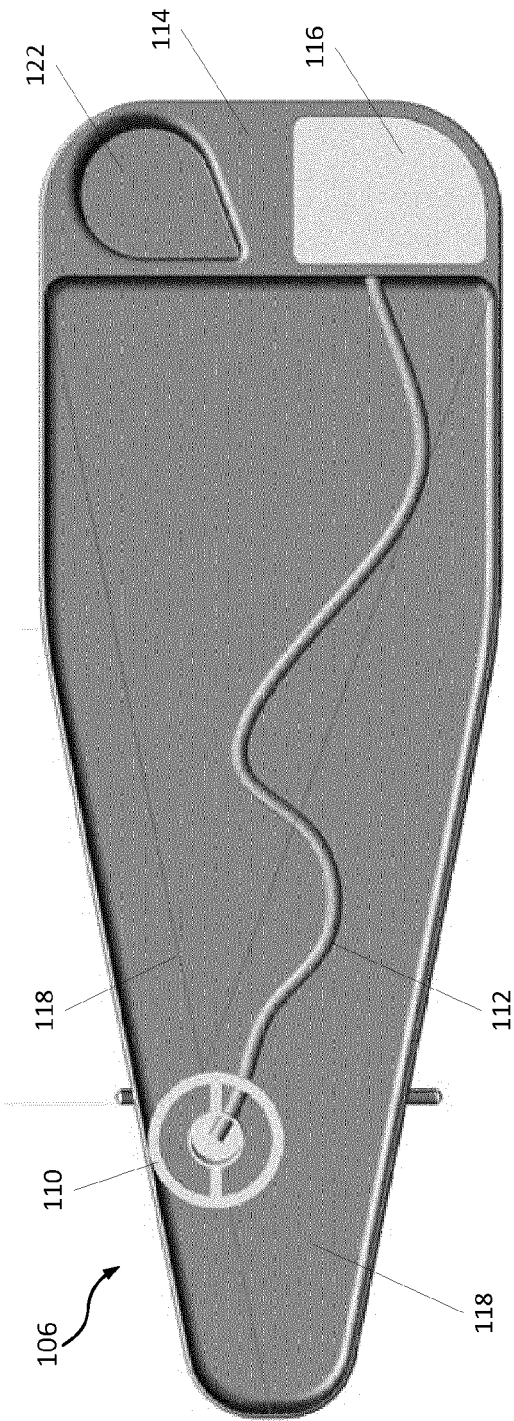


Figure 5

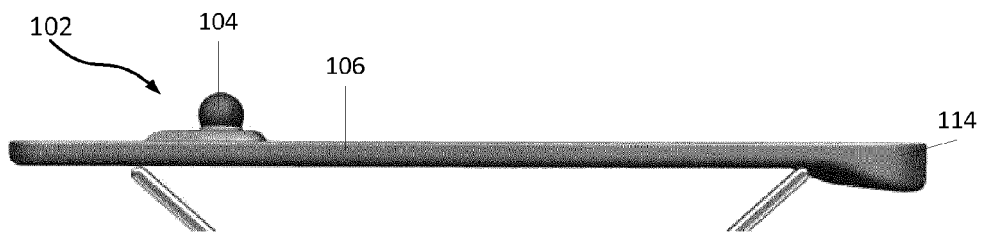


Figure 6

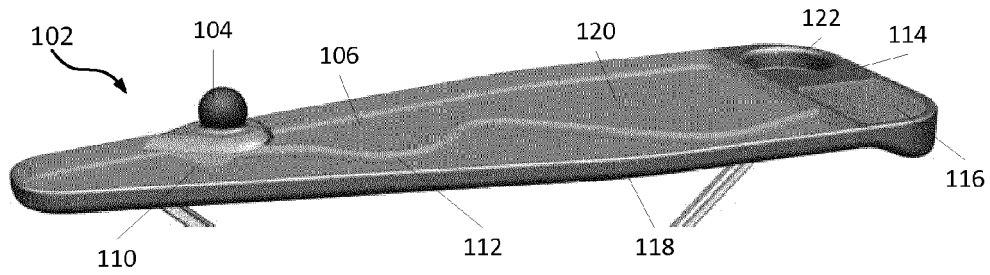


Figure 7

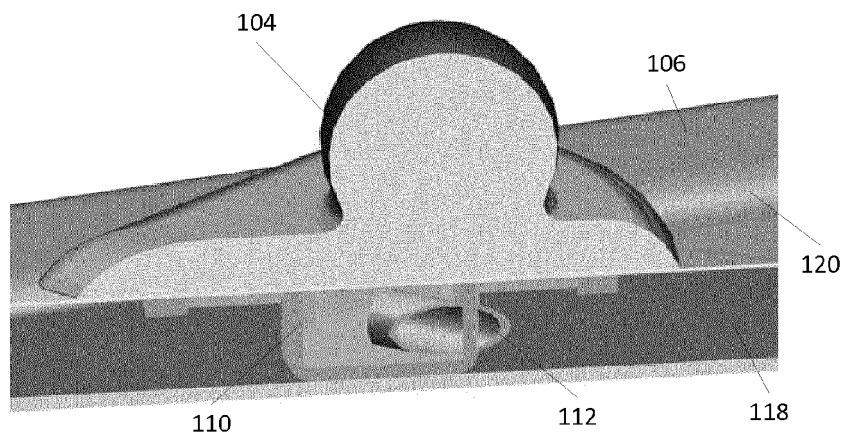


Figure 8

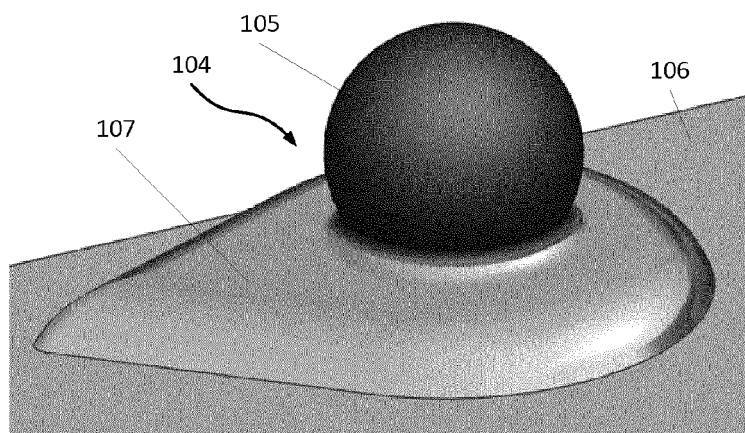


Figure 9

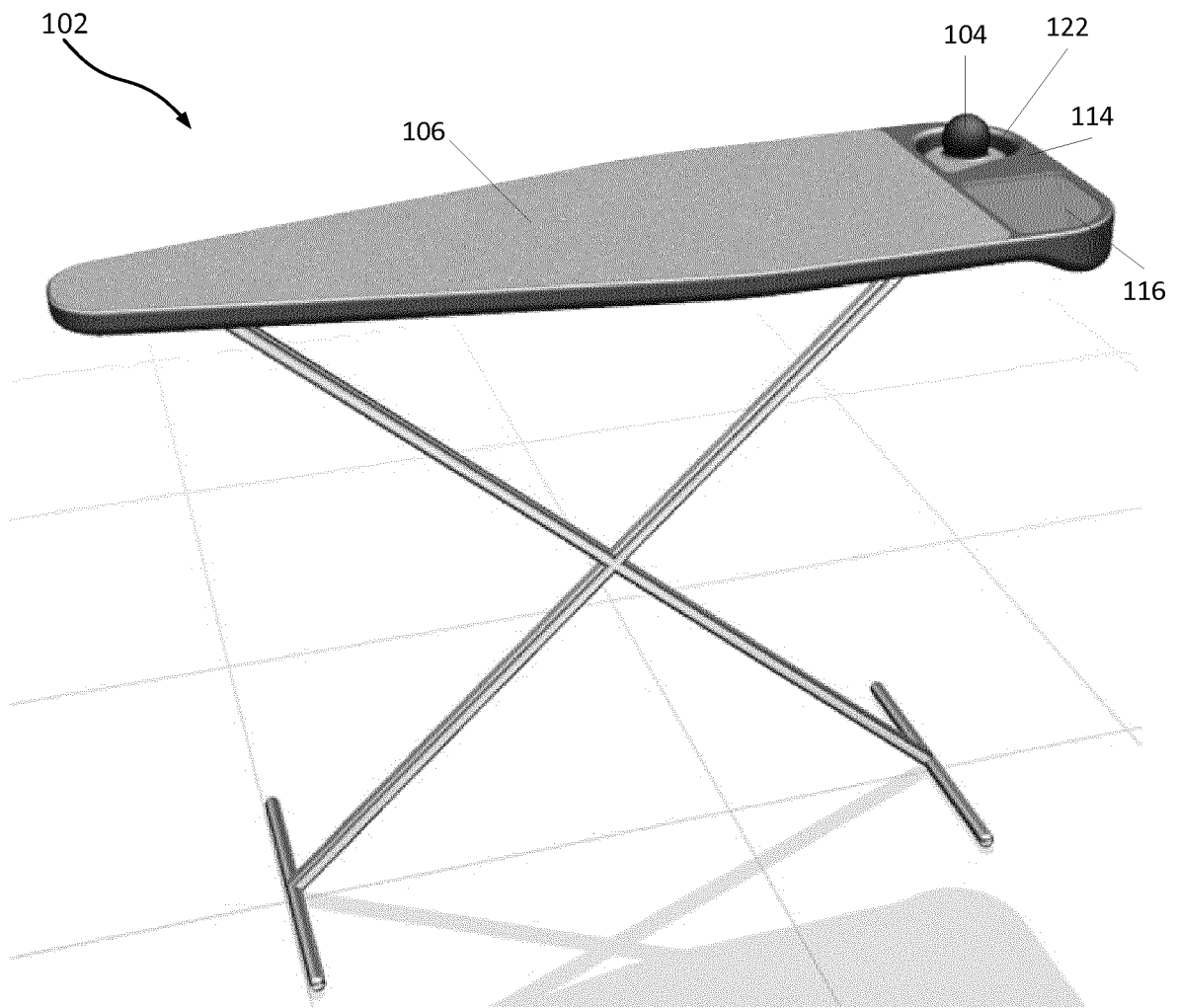


Figure 10