(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 July 2014 (17.07.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/108775 A1

(51) International Patent Classification:
A45D 1/20 (2006.01) *A45D 7/06* (2006.01)
A45D 7/00 (2006.01) *A45D 2/00* (2006.01)
A45D 7/04 (2006.01)

(21) International Application Number:
PCT/IB2013/061026

(22) International Filing Date:
17 December 2013 (17.12.2013)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/751,277 11 January 2013 (11.01.2013) US

(72) Inventor; and
(71) Applicant : **MOYAL, Daniel** [IL/IL]; 32 Bloch St., 6416138 Tel Aviv (IL).

(74) Agent: **FOGEL, Ronny**; 8 Gordon st., 5323512 Givatayim (IL).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) Title: HAIR STRAIGHTENING WITH VAPORS

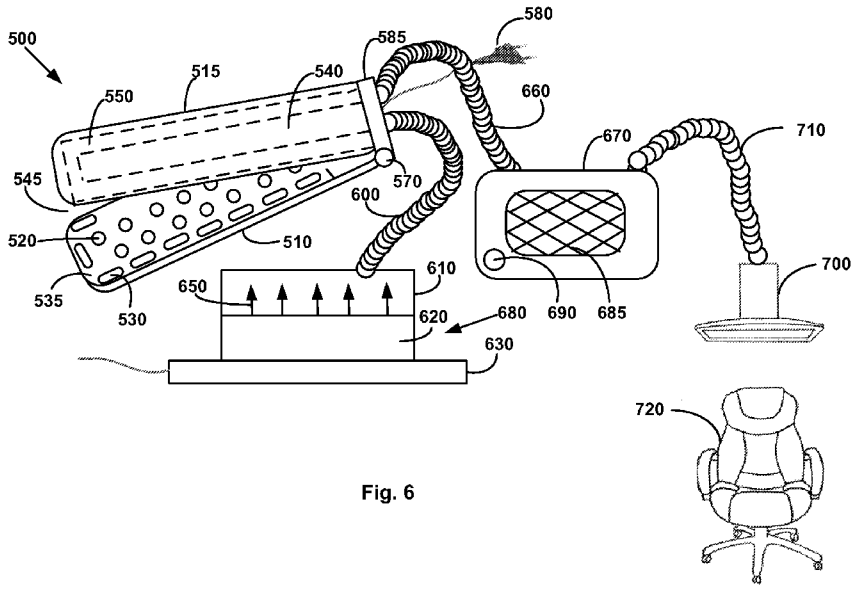

Fig. 6

(57) Abstract: A system for straightening hair using hair straightening formulation solution vapors, comprising: a hair straightening iron connected to an electricity source, said hair straightening iron comprising a pair of pressing members each having a heating block on its inner surface, the pressing members joined by a hinge, the heating blocks comprising holes connected to vapor conducting tunnels accommodated inside each one of the pressing members; a vapor conducting pipe connected to the tail end of the iron, said vapor conducting pipe opens to the vapor conducting tunnels; and a vaporizer connected to said vapor conducting pipe on its other end, said vaporizer comprising a heating element connected to a source of electricity and a container configured to be heated by said heating element.

WO 2014/108775 A1

HAIR STRAIGHTENING WITH VAPORS

FIELD OF THE INVENTION

The present invention pertains to the field of hair treatment and more particularly to a steam operated hair straightening.

BACKGROUND

Hair straightening is a hair styling technique which involves the flattening and straightening of hair in order to give it a smooth, streamlined, and 'sleek' appearance. It may be accomplished using a hair iron or hot comb, chemical relaxers, Japanese hair straightening, or Brazilian hair straightening. In addition, some shampoos, and conditioners and hair gels can help to make hair temporarily straight.

Hair irons and hot combs can only temporarily modify hair texture, whereas relaxers and the other methods permanently alter the structure of the hair, although new hair growth is not affected.

The Brazilian Keratin Treatment is a long-term blow dry for hair that lasts about three months. Pioneered in Brazil, the Brazilian Keratin Treatment is said to be able to be performed on all types of chemically treated hair (bleached, hi-lights, colored, permed, relaxed or previously straightened). It is used on frizzy, damaged, unhealthy, dull and mistreated hair.

Brazilian Keratin Treatment (also called escova progressiva, keratin straightening or BKT) is a method of temporarily straightening hair by sealing the hair with a liquid keratin and Formaldehyde solution with a flat iron. The process involves applying the formula to the head, waiting a prescribed time for the formula to be absorbed and then sealing the hair with a flat iron.

While keratin is indeed an ingredient in the formulas used to perform Brazilian Hair Straightening, the true active ingredient is Formaldehyde. Formaldehyde is known to be an aggressive carcinogen, and its fumes are extremely dangerous. Heat and moderate humidity levels accelerate the noxious effects of the chemical.

Some of the known effects of Formaldehyde are:

Some people are naturally highly sensitive to Formaldehyde, others may not be as sensitive but over time develop an allergy to it. It's in the chemical's make up to stir the immune system and cause sensitivity.
Runny nose, sore throat, headache, itching, and irritated eyes can occur with low levels of exposure.

It is also a known carcinogen, and smokers in particular are at a greater risk for cancers of the airways, including nasal passages when they are exposed to Formaldehyde.

It would be advantageous to shorten the exposure period to Formaldehyde in the process of hair straightening.

SUMMARY

According to a first aspect of the present invention there is provided a system for straightening hair using hair straightening formulation solution vapors, comprising: a hair straightening iron connected to an electricity source, said hair straightening iron comprising a pair of pressing members each having a heating block on its inner surface, the pressing members joined by a hinge, the heating blocks comprising holes connected to vapor conducting tunnels accommodated inside each one of the pressing members; a vapor conducting pipe connected to the tail end of the iron, said vapor conducting pipe opens to the vapor conducting tunnels; and a vaporizer connected to said vapor conducting pipe on its other end , said vaporizer comprising a heating

element connected to a source of electricity and a container configured to be heated by said heating element.

The system may further comprise at least one light source adapted to produce heat.

The at least one light source may be mounted in at least one of said pressing members.

The at least one light source may be external to said pressing members.

The system may further comprise cooling means adapted to cool said at least one light source.

According to another aspect of the present invention there is provided a method of straightening hair using hair straightening formulation solution vapors, comprising: providing a solution of hair straightening formulation; heating said solution to a boiling temperature; conducting vapors discharged from said boiling solution to a hair straightening iron comprising holes; and pressing the hair with said hair straightening iron, whereby said vapors are applied to the hair.

The method may further comprise using at least one light source to produce additional heat.

The at least one light source may be mounted in said hair straightening iron.

The at least one light source may be external to said hair straightening iron.

The method may further comprise cooling said at least one light source.

According to another aspect of the present invention there is provided a system for straightening hair using hair straightening formulation solution vapors, comprising: a hair straightening iron connected to an electricity source, said hair straightening iron comprising a pair of pressing members each having a heating block on its inner surface, the pressing members joined by a hinge, the heating blocks comprising a first set of holes connected to vapor conducting tunnels accommodated inside each one of the pressing members and a second set of holes connected to vapor removing tunnels accommodated inside each one of the pressing members; a vapor conducting pipe

connected to the tail end of the iron, said vapor conducting pipe opens to the vapor conducting tunnels; a vaporizer connected to said vapor conducting pipe on its other end , said vaporizer comprising a heating element connected to a source of electricity and a container configured to be heated by said heating element; a vapor removing pipe connected to the tail end of the iron; and a filtering device connected to the other end of said vapor removing pipe, said filtering device comprising a suction motor and a toxic fumes filter.

The system may additionally comprise a vapor collecting hood mounted over a user's head, said hood connected to said filtering device.

The system may further comprise at least one light source adapted to produce heat.

The at least one light source may be mounted in at least one of said pressing members.

The at least one light source may be external to said pressing members.

The system may further comprise cooling means adapted to cool said at least one light source.

According to another espect of the present invention there is provided a method of straightening hair using hair straightening formulation solution vapors, comprising: providing a solution of hair straightening formulation; heating said solution to a boiling temperature; conducting vapors discharged from said boiling solution to a hair straightening iron comprising first holes and second holes; pressing the hair with said hair straightening iron, whereby said vapors are applied to the hair through said first holes; and applying suction to said iron through said second holes, whereby toxic fumes are discarded.

The method may further comprise using at least one light source to produce additional heat.

The at least one light source may be mounted in said hair straightening iron.

The at least one light source may be external to said hair straightening iron.

The method may further comprise cooling said at least one light source

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, purely by way of example, to the accompanying drawings.

With specific reference now to the drawings in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of the preferred embodiments of the present invention only, and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the invention. In this regard, no attempt is made to show structural details of the invention in more detail than is necessary for a fundamental understanding of the invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the invention may be embodied in practice. In the accompanying drawings:

Fig.1 is a schematic representation of a prior-art hair straightening iron;

Fig. 2 is a schematic drawing of a hair straightening system according to an embodiment of the present invention;

Fig. 3 is a schematic front view of the hair straightening iron according to the embodiment of Fig. 2;

Fig. 4 is a schematic drawing of a hair straightening system according to another embodiment of the present invention;

Fig. 5 is a schematic front view of the hair straightening iron according to the embodiment of Fig. 4;

Fig. 6 is a schematic drawing of a hair straightening system according to yet another embodiment of the present invention;

Fig. 7 is a table showing various proportions of Formaldehyde and water for obtaining a required concentration of Formalin in a solution to be evaporated;

Fig. 8 is simplified pictorial illustration of the straightening iron constructed and operative in accordance with another embodiment of the invention;

Fig. 9 is a respective sectional illustration of the embodiment of Fig. 8;

Fig. 10 is simplified pictorial illustration of the straightening iron constructed and operative in accordance with another embodiment of the invention;

Fig. 11 is a respective sectional illustration of the embodiment of Fig. 10; and

Fig. 12 is simplified pictorial illustration of the straightening iron constructed and operative in accordance with another embodiment of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In the following detailed description, numerous specific details are set forth regarding the system and method and the environment in which the system and method may operate, etc., in order to provide a thorough understanding of the present invention. It will be apparent, however, to one skilled in the art that the present invention may be practiced without such specific details. In other instances, well-known components, structures and techniques have not been shown in detail to avoid unnecessarily obscuring the subject matter of the present invention. Moreover, various examples are provided to explain the operation of the present invention. It should be understood that these examples are exemplary. It is contemplated that there are other methods and systems that are within the scope of the present invention. Also, the same reference numerals are used in the drawings and in the description to refer to the same elements to simplify the description.

The system of the present invention attempts to overcome the problem of exposure to toxic substances during chemical hair treatment, by reducing the exposure of the

hairdresser and the user's hair and skin to Formaldehyde, both in quantity and in duration of time.

The system is described with reference to Formaldehyde formulation being spread on the hair and Formaldehyde fumes being discharged into the air during Brazilian Keratin Treatments, but is suitable for any existing or future chemical hair treatment requiring treatment of hair with toxic products.

The system, products and method of the present invention provide a new way of performing hair straightening, by exposing the hair to vaporized products instead of applying a liquid/crème/gelatin formula to the hair and letting it be absorbed.

Fig.1 is a schematic representation of a prior-art hair straightening iron, generally denoted 100. The hair straightening iron 100 comprises a pair of pressing members (110, 120) each having a heating block (150, 160 respectively), the surface of which acts as a holding surface for hair to be straightened. The pressing members (110, 120) are joined by a hinge 170 for free opening and closing. An electric cord 180 connects the hair iron 100 to a source of electricity (not shown).

Fig. 2 is a schematic drawing of a hair straightening system according to an embodiment of the present invention.

The hair straightening system includes a hair straightening iron 200 comprising a pair of pressing members (210, 215) each having a heating block (225, 235 respectively) on its inner surface, which acts as a holding surface for hair to be straightened while ironing. The pressing members (210, 215) are joined by a hinge 270 for free opening and closing. An electric cord 280 connects the hair straightening iron 200 to a source of electricity (not shown).

The heating blocks comprise holes 220 (only bottom surface holes shown), connected to vapor conducting tunnels (245, 265) accommodated inside each one of the pressing members (only upper tunnel 245 shown in dotted lines).

A vapor conducting pipe 400 is connected to the tail end 255 of the iron, which opens to the vapor conducting tunnels.

Vapor conducting pipe 400 is connected on its other end with a vaporizer 480, which comprises a heating element 430 connected to a source of electricity (not shown) by electric cord 440 and a container 410.

In operation, container 410 is filled with a Formaldehyde solution 420 in a required concentration (see Fig. 6), which is heated by heating element 430 to the solution's boiling temperature, whereby vapors 450 are discharged into pipe 400, through vapor tunnels 245 and emerge via holes 220 onto the hair being ironed, thus performing the straightening function.

Fig. 3 is a schematic front view of the hair straightening iron 200 according to the present invention, showing vapor tunnels 245, 265 and vapors 310, 320 flowing from the tunnels

Fig. 4 is a schematic drawing of a hair straightening system according to another embodiment of the present invention.

The hair straightening system includes a hair straightening iron 500 comprising a pair of pressing members (510, 515) each having a heating block (535, 545 respectively), which acts as a holding surface for hair to be straightened. The pressing members (510, 515) are joined by a hinge 570 for free opening and closing. An electric cord 580 connects the hair straightening iron 500 to a source of electricity (not shown).

The heating blocks comprise holes 520 (only bottom surface holes shown), connected to vapor conducting tunnels (540, 542) accommodated inside each one of the pressing members (only upper tunnel 540 shown in dotted lines).

A vapor conducting pipe 600 is connected to the tail end 585 of the iron, which opens to the vapor conducting tunnels.

Vapor conducting pipe 600 is connected on its other end with a vaporizer 680, similar to the vaporizer 480 of the embodiment of Fig. 2, which comprises a heating element 630 connected to a source of electricity (not shown) by electric cord 640 and a container 610.

The heating blocks comprise additional holes 530 (only bottom surface holes shown), connected to a set of vapor removing tunnels (550, 552) accommodated inside each one of the pressing members (only upper tunnel 550 shown in dotted lines).

A vapor removing pipe 660 is connected to the tail end 585 of the iron, which opens to the vapor removing tunnels.

Vapor removing pipe 660 is connected on its other end with a filtering device 670. Filtering device 670 comprises a suction motor (not shown), as known in the art of vacuum cleaners and a filter 685. Filter 685 is a filter especially designed to filter Formaldehyde fumes, such as AC4142, provided by Philips, or Formaldehyde Filter, provided by Airfiltronix Corp. of Clifton, NJ. An outlet 690 discharges clean filtered air from the filtering device 670 back into the atmosphere.

In operation, container 610 is filled with a Formaldehyde solution 620 in a required concentration (see Fig. 6), which is heated by heating element 630 to the solution's boiling temperature, whereby vapors 650 are discharged into pipe 600, through vapor conducting tunnels (540, 542) and emerge via holes 520 onto the hair being ironed.

Toxic fumes are sucked back through vapor removing tunnels (550, 552) into vapor removing pipe 660 and into filtering device 670.

Fig. 5 is a schematic front view of the hair straightening iron 500 according to the present invention, showing vapor conducting tunnels (530, 540) and vapors (516, 520) flowing from the tunnels. Fig. 5 additionally shows vapor removing tunnels (550, 552) and vapors (562, 564) flowing into the tunnels.

Fig. 6 is a schematic drawing of a hair straightening system according to yet another embodiment of the present invention.

The system of Fig. 6 incorporates the system of Fig. 4 and additional vapor suction means comprising a vapor collecting hood 700, such as known in the art of kitchen vapor collectors, which may be mounted over the treated client's chair 720, to

provide additional fumes suction. Vapor collecting hood 700 is connected to a flexible pipe 710 which connects it to the filtering device 670 or to a different filtering device. The vapor collecting hood 700 may be mounted on the wall, on the ceiling, or on the client's chair.

Fig. 7 is a table showing various exemplary proportions of Formaldehyde and water for obtaining 20 a required concentration of Formalin in 20 ml of solution to be evaporated.

During the BKT procedure heat is required to vaporize the Formaldehyde solution but also to heat up the hair and thereby accelerate and enhance the absorption of the chemical into the hair. Also, flattening is more efficient when hair is at elevated temperature. Conventionally heat is applied to the hair by hot air and by means of contact to the hot surfaces of the flattening iron.

In certain embodiments of the present invention the hair is heated by means of radiation of visible or invisible light from light sources.

Melanin found in hair shaft is an efficient light absorbent in a wide range of wavelengths, spanning the ultraviolet, the visible light and the near infrared (IR). When light is absorbed by the hair, heat is generated which then diffuses to other parts of the hair. This absorption of light by melanin was exploited for the purpose of bodily hair removal where hair follicle is damaged by the heating effect of the absorbed light, known as photothermolysis. While the action of light sources in hair removal application is to provide sufficient power and energy dose for photothermolysis, these light sources are well suited to provide non-damaging heat to hair depending on the mode of operation, notably and most readily by driving these light sources at powers below the damage threshold. In fact, it is often more challenging to operate the light sources at conditions necessary for photothermolysis than these required to elevate the temperature. For example, the fluence (energy per unit area) emitted from light emitting diodes (LED) may be insufficient to induce photothermolysis, yet can be used for the purpose of heating. Secondly, when light is applied to the skin it can be absorbed by other chromophores, particularly water

and oxyhemoglobin. Therefore, in hair removal one is limited to a narrow range of wavelengths of approximately 700 to 1000 nanometer (nm) where the light is selectively absorbed by melanin, that is, at a wavelength range where light is primarily absorbed by melanin and less so by water or oxyhemoglobin. Nevertheless, high power light sources emitting at 700 nm to 1000 nm are readily available, particularly laser diodes (LD).

Reference is made now to Fig. 8 which is a simplified pictorial illustration of the straightening iron constructed and operative in accordance with another preferred embodiment of the invention, and to Fig. 9 which is a respective sectional illustration of the invention. As seen in Fig 8 and Fig 9 the straightening iron 800 comprises transparent windows 801 for passing the light 902 from a light sources 903 located behind the windows (shown in sectional illustration Fig 9).

The light sources used are any light sources that emit at the wavelength absorbed by melanin. Melanin has a broad absorption spectrum, with higher absorption in the ultraviolet (UV), however because of health hazards consideration, it may be preferable to operate at visible light or near IR range. High power LED arrays are one such sort of light sources. The LED arrays are further provided with optical assembly 904 to guide the light through the exit window. In available commercial LED illuminators optical components such as lenses, reflectors, or collimators are used.

In another arrangement the light sources can be laser diodes (LD) as a single emitters or stacked arrays such as for example available from DILAS http://www.dilas.com/pages/products.php?category=16&series=7.

As in most light sources, most of the electrical energy is converted to heat. Typically for LEDs the watt-to-watt efficiency, namely power of emitted light vs electrical power input, ranges from 40% for red light to 15% for green light. To operate the light source at high efficiency and prevent source damage heat needs to be removed. The process of heat dissipation from the light source can be viewed as accomplished in two steps: The first involves the transport of thermal energy away

from the source to an external heat sink that absorbs the intense thermal energy. In the second stage the heat is dissipated into the surrounding environment. This is primary accomplished by either natural or forced air convection. Forced air convection typically involves an electric fan responsible for cooling the heat sink. In another preferred embodiment of the invention shown in Fig. 10 and respective sectional illustration Fig. 11, the straightening iron 1000 is provided with at least one electrical fan 1008 (two shown) that forces air flow around the light source 1103. The resulted heated air 1105 is further conveyed through air conducting channels (not shown) and forced through ventilation openings 1006 located at the blades 1010 of the straightening iron.

One effective method for guiding a light from a light source is by optical fiber. In accordance with yet another embodiment of the invention shown in Fig. 12 the light sources 1303 are located in a separate module 1305 wherein the light 1301 emitted from the light sources 1303 is guided through the windows 1302 located within the blades 1310 of the straightening iron 1300, by means of optical fibers 1304. In such arrangement the advantage is that the light sources are not limited to space within the straightening iron, and hence the provided light power can be considerably higher, and more efficient cooling of the light sources. In accordance with previously described embodiment, if the light sources are cooled by forced air produced by an electrical fan, the resulting hot air can be further utilized for heating the hair. The fan 1307 in Fig 13 forces the air 1308 around the light sources 1303 and through a flexible hose 1308 towards the ventilation holes 1311 located within the straightening iron.

It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined by the appended claims and includes both combinations and sub-combinations of the various features described hereinabove as well as variations and modifications thereof which would occur to persons skilled in the art upon reading the foregoing description.

For example, pipes 400 and 600, and possibly optical fiber 1304 may be packed in one tube and/or vaporizer 680 and filtering device 670 may be assembled in a single casing.

CLAIMS

1. A system for straightening hair using hair straightening formulation solution vapors, comprising:

   a hair straightening iron connected to an electricity source, said hair straightening iron comprising a pair of pressing members each having a heating block on its inner surface, the pressing members joined by a hinge, the heating blocks comprising holes connected to vapor conducting tunnels accommodated inside each one of the pressing members;

   a vapor conducting pipe connected to the tail end of the iron, said vapor conducting pipe opens to the vapor conducting tunnels; and

   a vaporizer connected to said vapor conducting pipe on its other end , said vaporizer comprising a heating element connected to a source of electricity and a container configured to be heated by said heating element.
2. The system of claim 1, further comprising at least one light source adapted to produce heat.
3. The system of claim 2, wherein said at least one light source is mounted in at least one of said pressing members.
4. The system of claim 2, wherein said at least one light source is external to said pressing members.
5. The system of claim 2, further comprising cooling means adapted to cool said at least one light source.
6. A method of straightening hair using hair straightening formulation solution vapors, comprising:

   providing a solution of hair straightening formulation;

   heating said solution to a boiling temperature;

   conducting vapors discharged from said boiling solution to a hair straightening iron comprising holes; and

   pressing the hair with said hair straightening iron, whereby said vapors are applied to the hair.
7. The method of claim 6, further comprising using at least one light source to produce additional heat.

8. The method of claim 7, wherein said at least one light source is mounted in said hair straightening iron.
9. The method of claim 7, wherein said at least one light source is external to said hair straightening iron.
10. The method of claim 7, further comprising cooling said at least one light source.
11. A system for straightening hair using hair straightening formulation solution vapors, comprising:

a hair straightening iron connected to an electricity source, said hair straightening iron comprising a pair of pressing members each having a heating block on its inner surface, the pressing members joined by a hinge, the heating blocks comprising a first set of holes connected to vapor conducting tunnels accommodated inside each one of the pressing members and a second set of holes connected to vapor removing tunnels accommodated inside each one of the pressing members;

a vapor conducting pipe connected to the tail end of the iron, said vapor conducting pipe opens to the vapor conducting tunnels;

a vaporizer connected to said vapor conducting pipe on its other end , said vaporizer comprising a heating element connected to a source of electricity and a container configured to be heated by said heating element;

a vapor removing pipe connected to the tail end of the iron; and

a filtering device connected to the other end of said vapor removing pipe, said filtering device comprising a suction motor and a toxic fumes filter.

12. The system of claim 11, additionally comprising a vapor collecting hood mounted over a user's head, said hood connected to said filtering device.
13. The system of claim 12, further comprising at least one light source adapted to produce heat.
14. The system of claim 13, wherein said at least one light source is mounted in at least one of said pressing members.
15. The system of claim 13, wherein said at least one light source is external to said pressing members.

16. The system of claim 13, further comprising cooling means adapted to cool said at least one light source.

17. A method of straightening hair using hair straightening formulation solution vapors, comprising:

providing a solution of hair straightening formulation;

heating said solution to a boiling temperature;

conducting vapors discharged from said boiling solution to a hair straightening iron comprising first holes and second holes;

pressing the hair with said hair straightening iron, whereby said vapors are applied to the hair through said first holes; and

applying suction to said iron through said second holes, whereby toxic fumes are discarded.

18. The method of claim 17, further comprising using at least one light source to produce additional heat.

19. The method of claim 18, wherein said at least one light source is mounted in said hair straightening iron.

20. The method of claim 18, wherein said at least one light source is external to said hair straightening iron.

21. The method of claim 18, further comprising cooling said at least one light source.

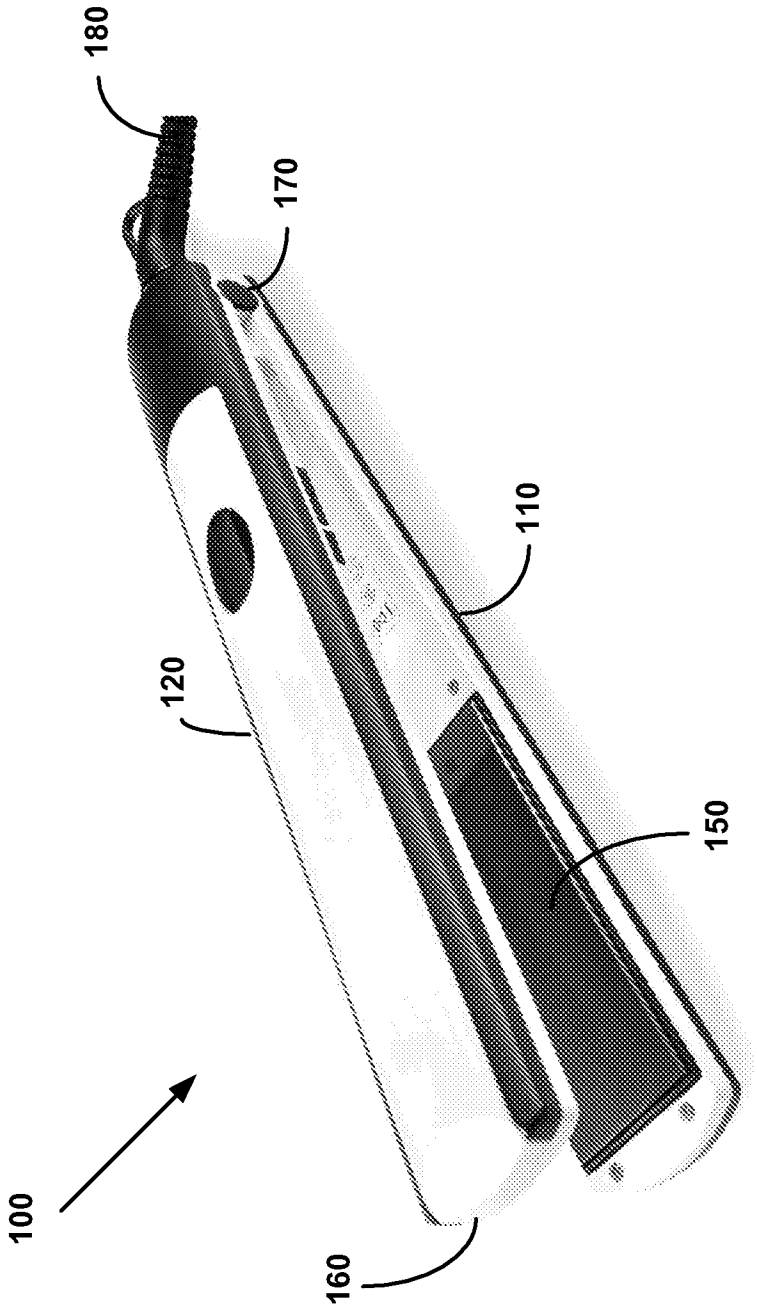

Fig. 1 – Prior Art

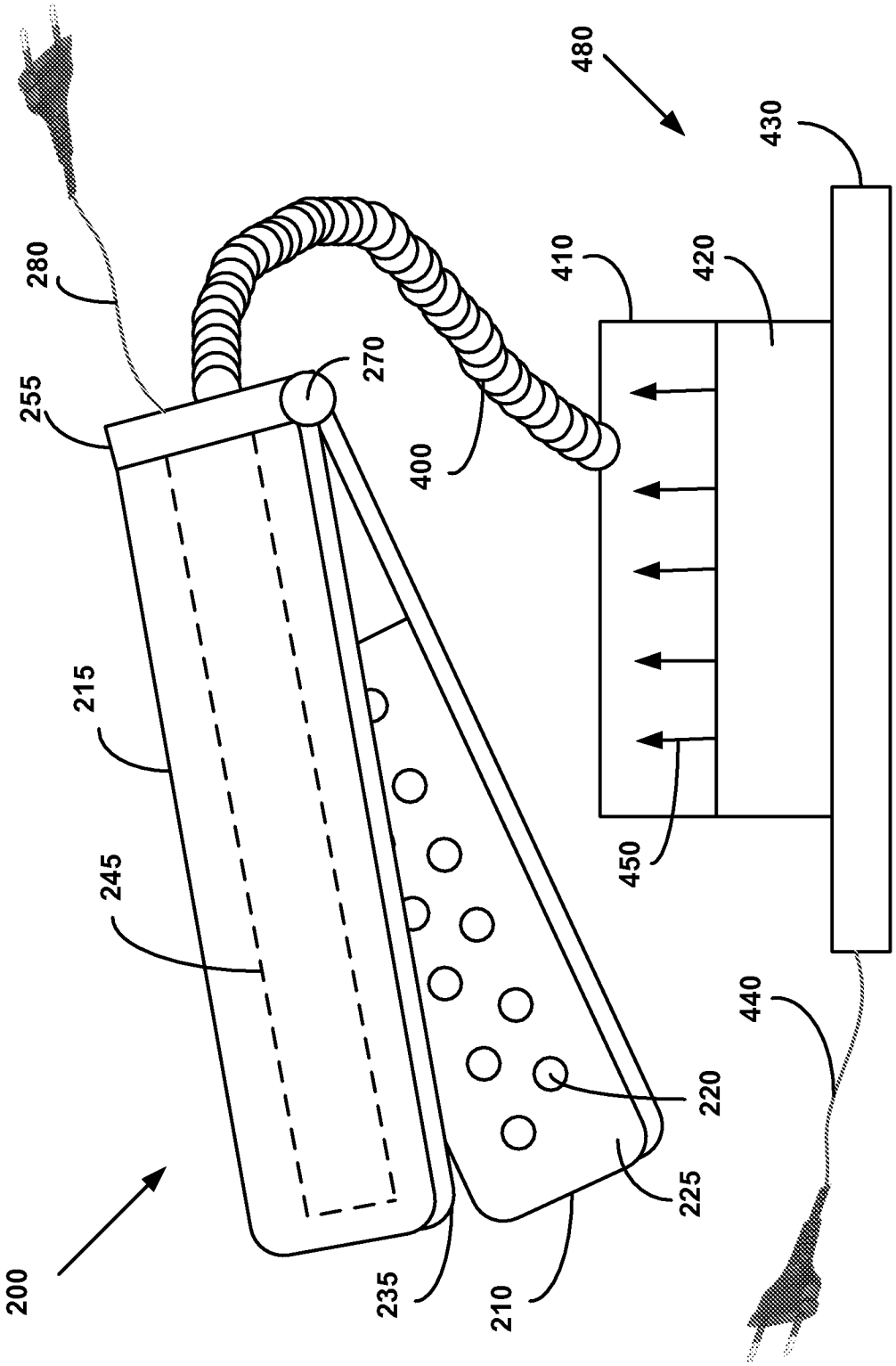
480
430
280
410
420
270
255
400
215
245
450
440
220
225
200
235
210

Fig. 2

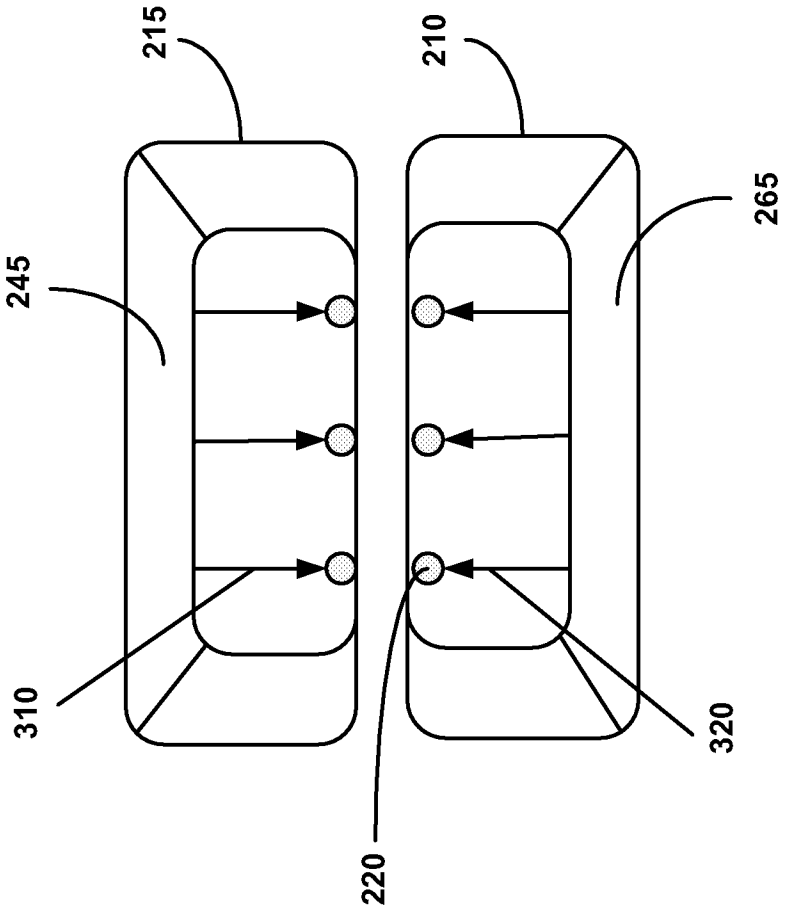

Fig. 3

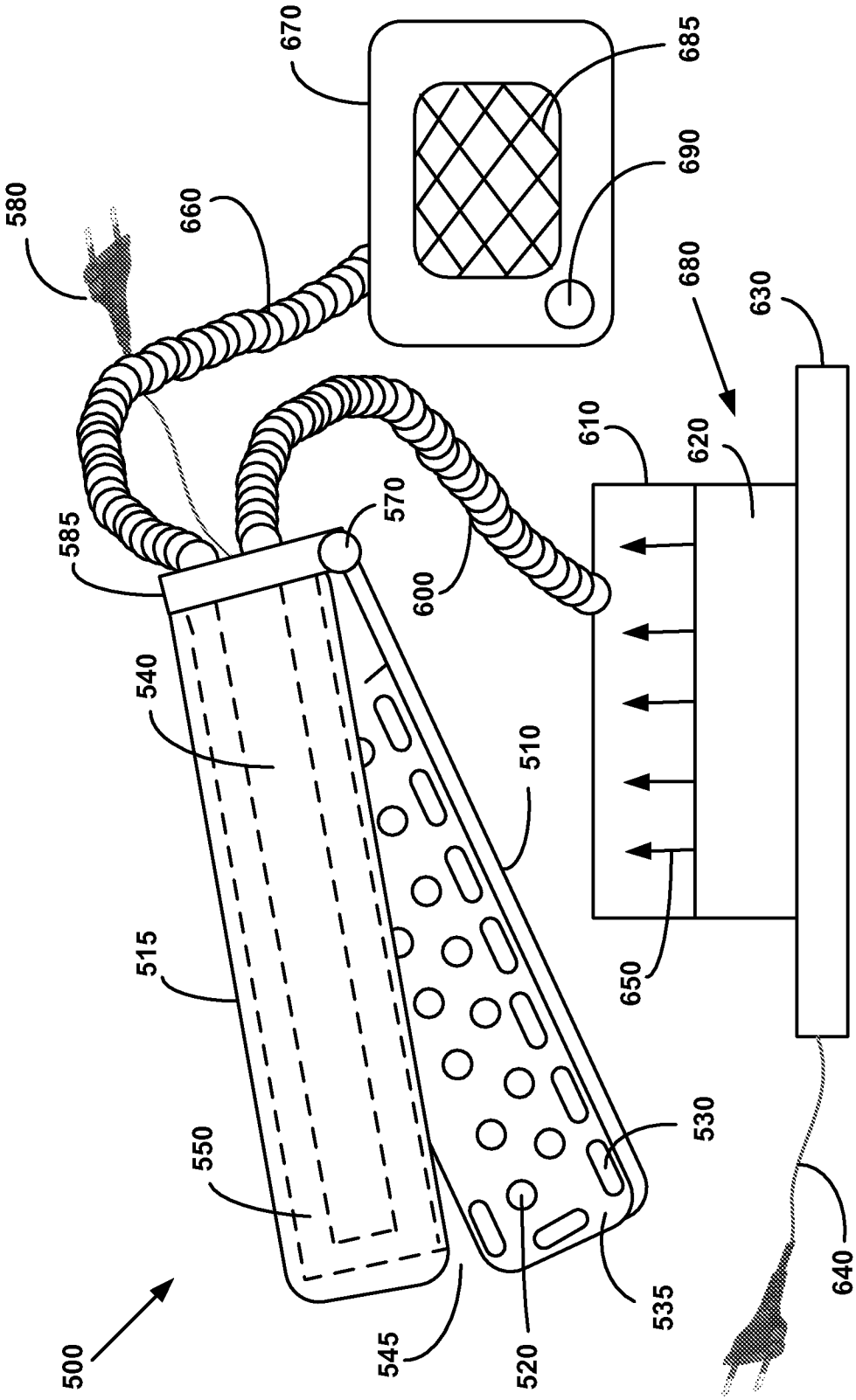
670
685
690
580
660
680
630
610
620
570
585
600
540
510
515
650
550
530
640
535
545
520
500

Fig. 4

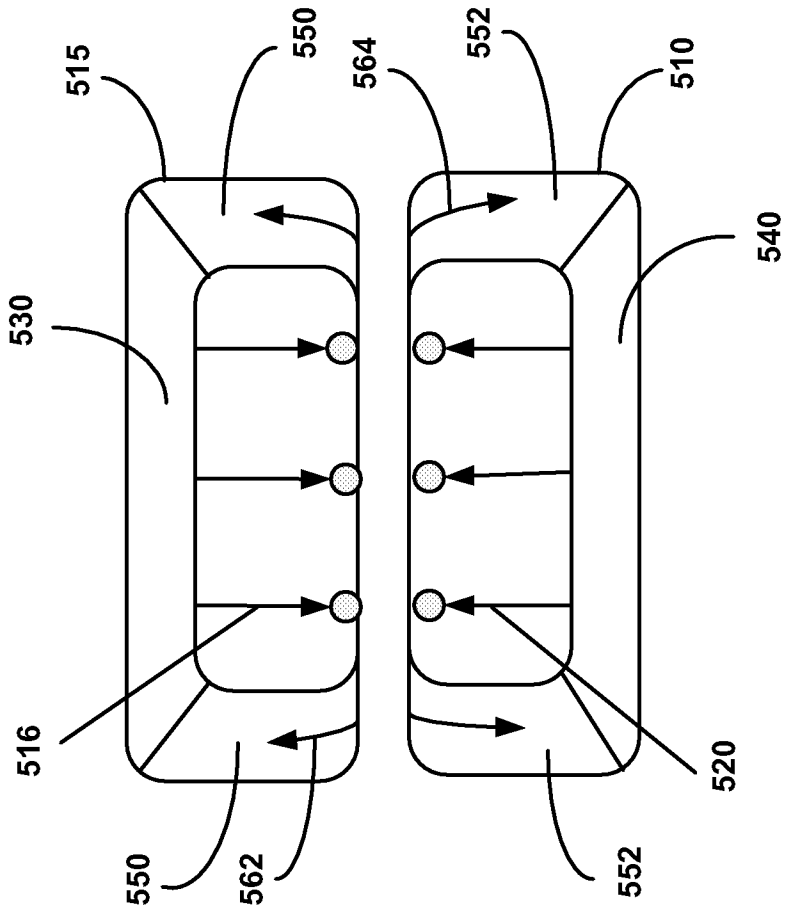

Fig. 5

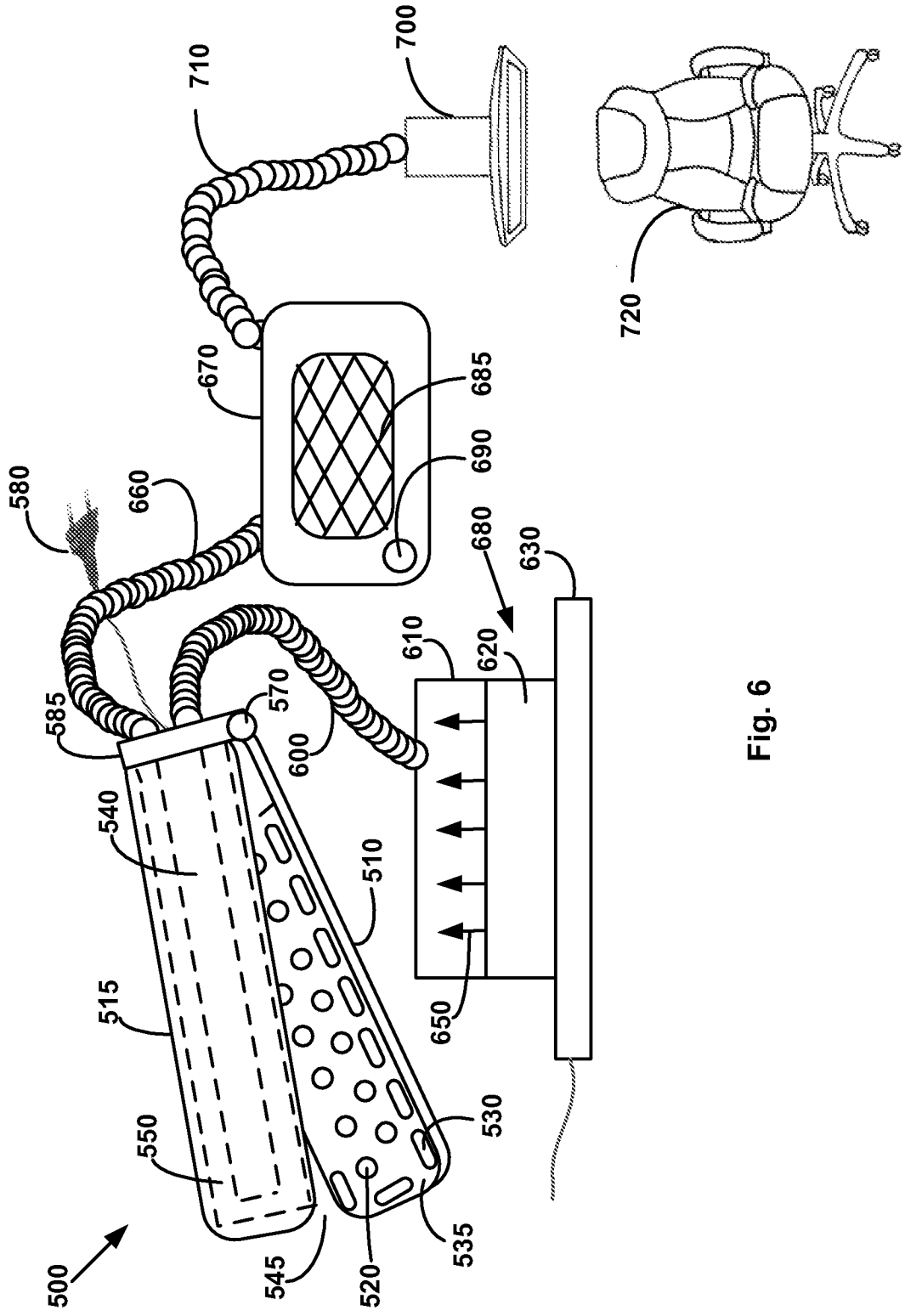
700
710
720
670
685
690
580
660
680
630
610
620
570
585
600
540
510
515
650
550
530
535
545
520
500

Fig. 6

Water (ml)	Formaldehyde 33% (ml)	Net Formalin %
19.88	0.12	0.20
19.76	0.24	0.40
19.64	0.36	0.60
19.52	0.48	0.80
19.39	0.61	1.00
19.27	0.73	1.20
19.15	0.85	1.40
19.03	0.97	1.60
18.91	1.09	1.80
18.79	1.21	2.00

Fig. 7

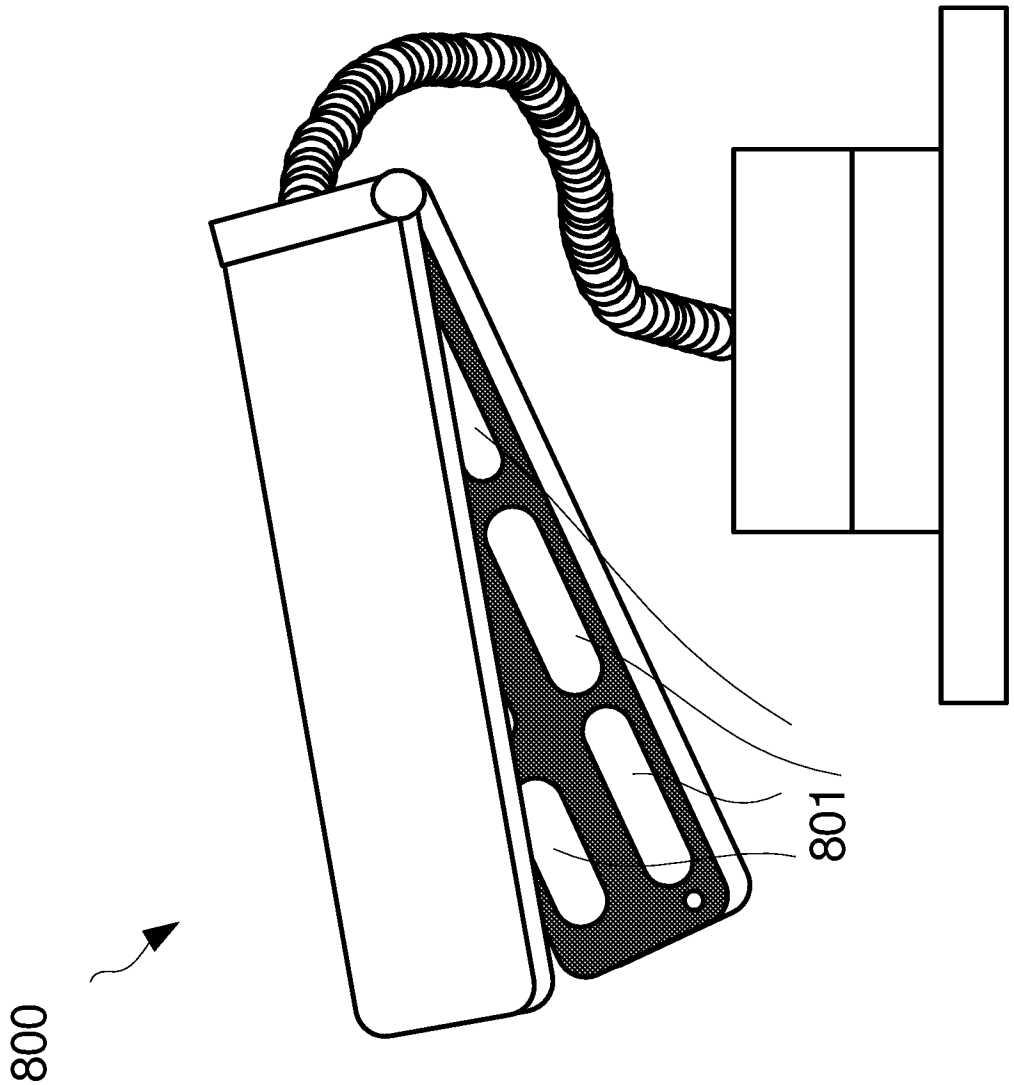

Fig. 8

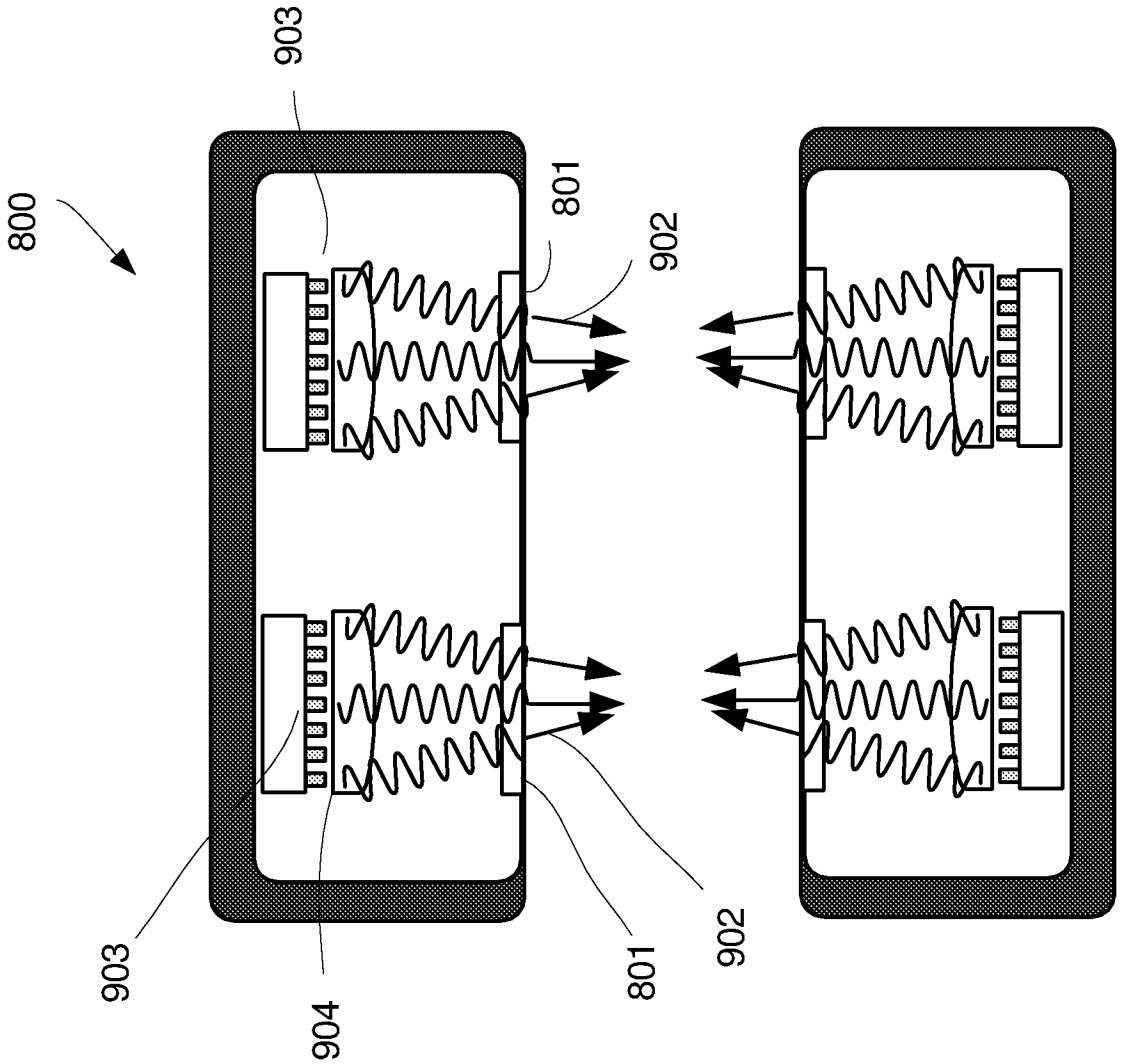

Fig. 9

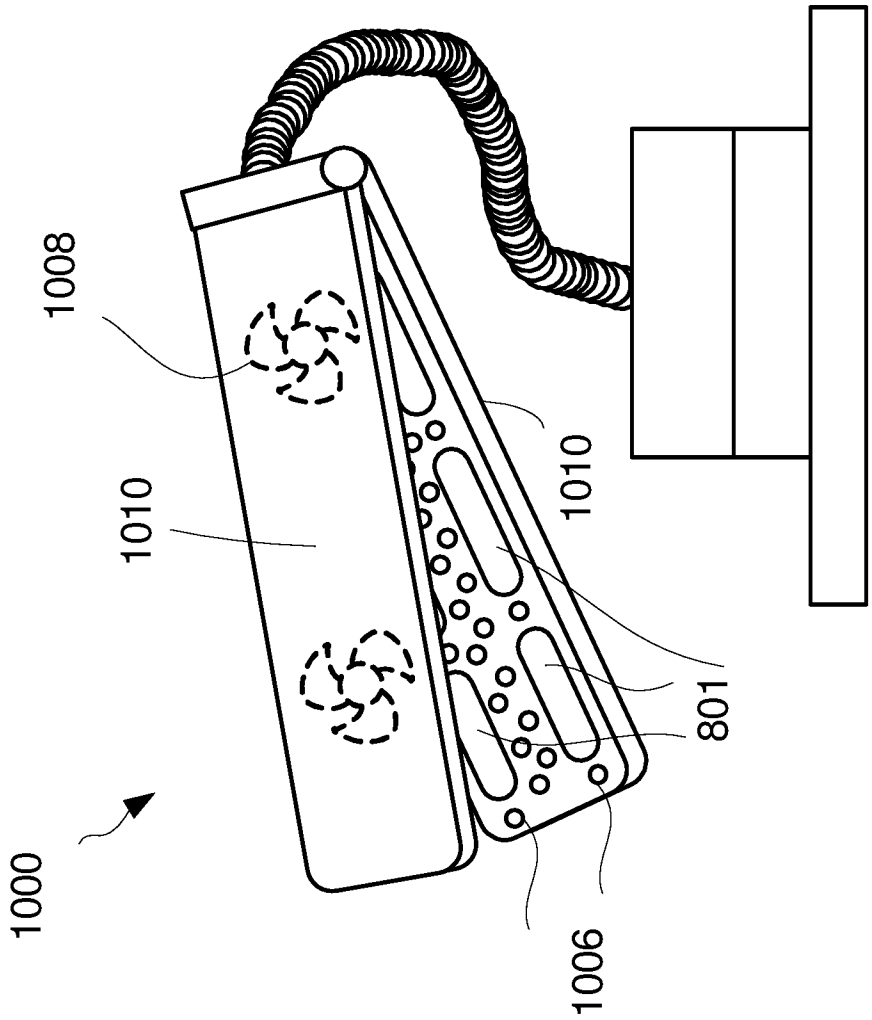

Fig. 10

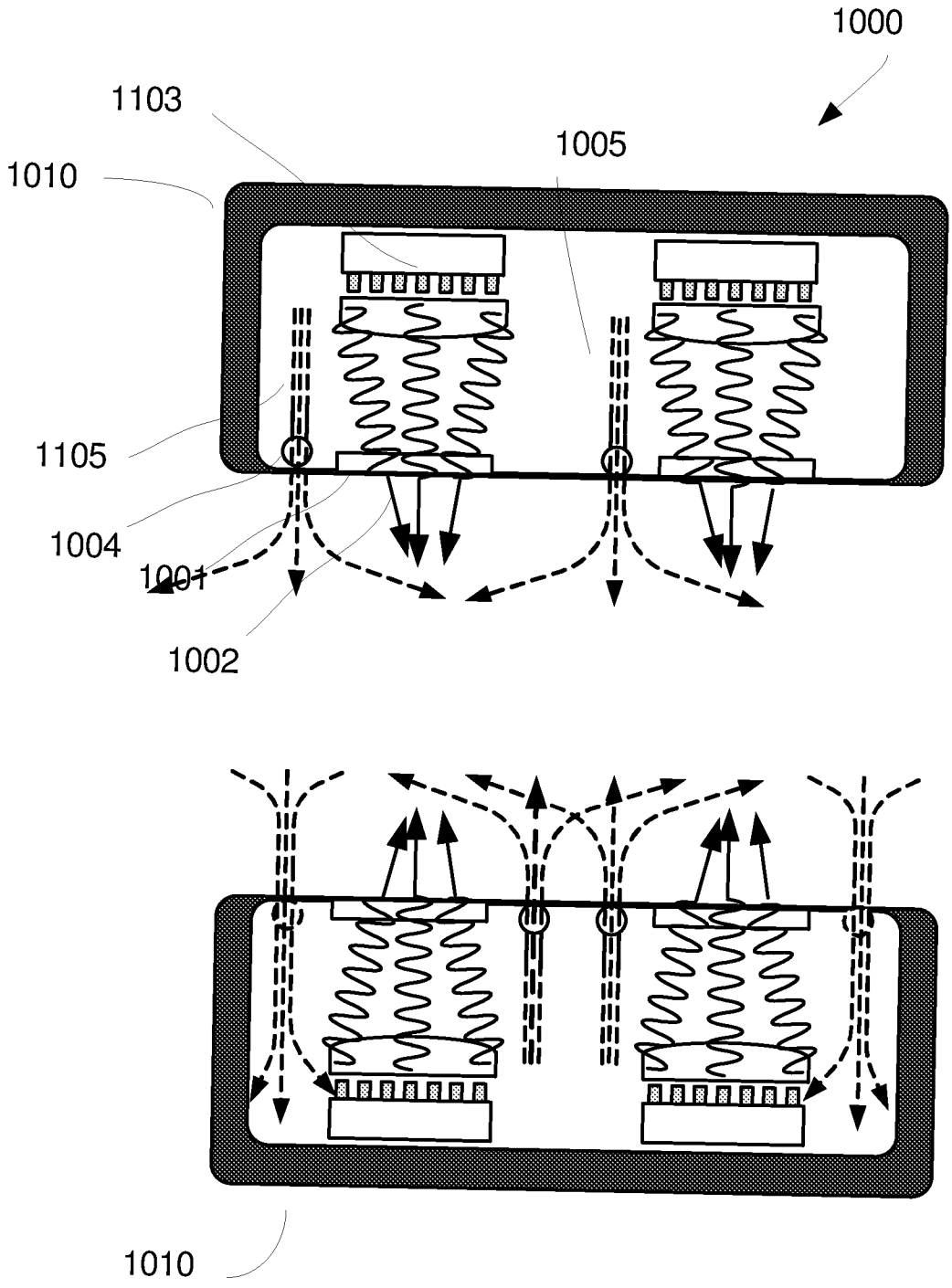

Fig. 11

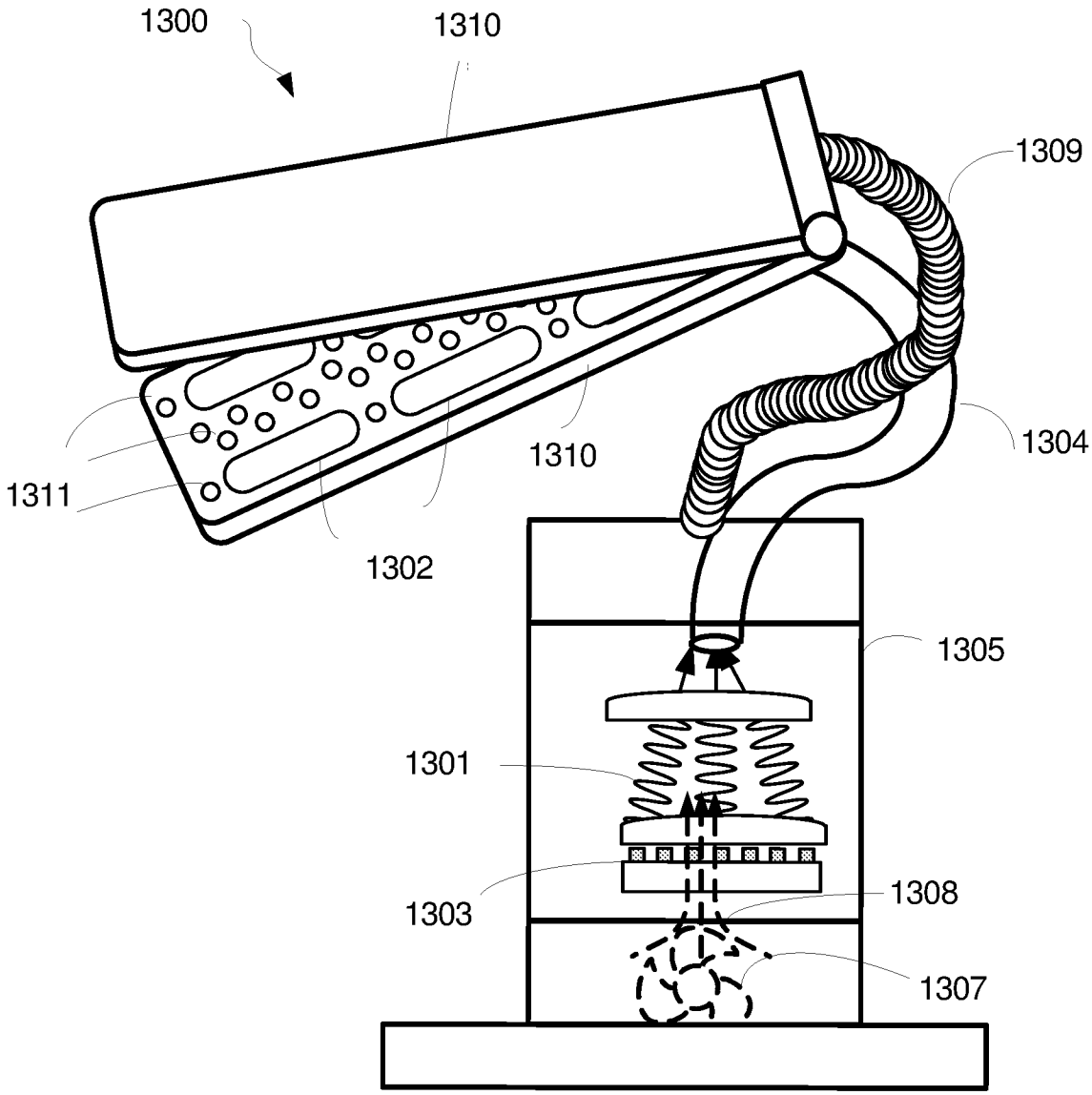

Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2013/061026

A. CLASSIFICATION OF SUBJECT MATTER

IPC (2014.01) A45D 1/20, A45D 7/00, A45D 7/04, A45D 7/06, A45D 2/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC (2014.01) A45D 7/00, A45D 7/04, A45D 7/06, A45D 1/20

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Databases consulted: Esp@cenet, Google Patents, FamPat database
Search terms used: straightening hair suction holes iron vapor, hair straightening light and IPC A45D

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2011/0277634 A1 D.Moyal 17 Nov 2011 (2011/11/17) the whole document	1-21
Y	JP 2012020943 A Alpha brain world co ltd 02 Feb 2012 (2012/02/02) abstract	2-5,7-10,12-16, 18-21
X	CN 201624259 U RUNHUAN XIE 10 Nov 2010 (2010/11/10) the whole document	1-21

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 Mar 2014	03 Apr 2014

Name and mailing address of the ISA:	Authorized officer
Israel Patent Office Technology Park, Bldg.5, Malcha, Jerusalem, 9695101, Israel Facsimile No. 972-2-5651616	Al-Muhannad Rafa Telephone No. 972-2-5651751

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2013/061026

Patent document cited search report	Publication date	Patent family member(s)	Publication Date
US 2011/0277634 A1	17 Nov 2011	NONE	
JP 2012020943 A	02 Feb 2012	JP 2012020943 A	02 Feb 2012
CN 201624259 U	10 Nov 2010	CN 201624259 U	10 Nov 2010