

PATENT SPECIFICATION

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(54) STEAM CURLING IRON

(71) We, BRISTOL-MYERS COMPANY, a Corporation organised and existing under the laws of the State of Delaware, United States of America, having offices located at 5 345 Park Avenue, New York, New York 10022, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to a steam curling iron. More particularly, it relates to an iron with a device for causing the opening and closing of a liquid delivery conduit between a reservoir and a vaporization chamber of the iron, depending upon the temperature attained by a heating element in the chamber.

One known steam curling iron is capable of projecting a measured amount of steam against a user's hair to promote its curling or setting. Such an iron includes a liquid reservoir, a heating chamber having a heating element, and a pump for delivering liquid from the reservoir into the chamber for vaporization. Additionally, means are provided therein for regulating the maximum temperature of the heating element and liquid being heated thereby. However, neither the above described iron nor any other known to the applicants include means, such as the device in the iron of this invention, for preventing delivery of liquid from the reservoir into the chamber until the heating element attains a desired minimum temperature. Thus, this device helps insure that steam emitted from the iron will essentially be within prescribed limits.

According to this invention we provide a steam curling iron having a liquid reservoir, a vaporization chamber having means for vaporizing the liquid, means for delivering the liquid to be vaporized from

the reservoir to the vaporization chamber, and heat-responsive closure means for selectively blocking the movement of liquid from the reservoir to the vaporization chamber.

Preferably, when the vaporization chamber has attained a sufficient temperature to vaporize the liquid, the closure means allows liquid delivery thereto; otherwise, the closure means prevents liquid delivery to the vaporizing chamber. One embodiment of the closure means includes a bimetallic disc and a liquid delivery tube. The disc has the property of changing its shape when heated to a particular temperature, the temperature being the same as or corresponding to the minimum temperature required of the means for vaporizing the liquid. The liquid delivery tube, through which the liquid may be delivered to the vaporizing chamber, is fixedly attached to the disc and movable both in and out of contact with the valve, upon change of shape of the disc, to close and open the valve. The tube contacts the valve when the disc is in an unheated condition to prevent liquid delivery therethrough and is moved out of contact with the valve when the disc is in a heated condition to allow liquid delivery therethrough, so that the control device prevents liquid from being delivered to the vaporizing chamber until it reaches the minimum required temperature.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a longitudinal view of a steam curling iron which is one embodiment of the present invention is shown, the iron being in section.

Fig. 2 is a sectional view taken along line 2-2 of Fig. 1.

Fig. 3 is a broken away, longitudinal view, partly in section, of the steam curling iron of Fig. 1.

Fig. 4 is a sectional view taken along line 4-4 of Fig. 3.

Fig. 5 is a perspective view of the clip spring of the steam curling iron of Fig. 1.

Fig. 6 is a sectional view taken along line 6-6 of Fig. 1 showing a device in the iron in position for opening communication between the reservoir and heating chamber of the steam curling iron.

Fig. 7 is a view similar to Fig. 6 showing a device in the iron in position for closing off communication between the reservoir and heating chamber of the steam curling iron.

Fig. 8 is a sectional view taken along line 8-8 of Fig. 6.

DESCRIPTION OF THE INVENTION

Steam curling irons which may be modified to accord with the present invention are shown and described in U.S. Pat. No. 3,835,292, the disclosure of which is incorporated by reference herein.

A steam curling iron 20 according to the present invention is illustrated in Fig. 1. The iron includes a tubular housing 22 formed of an upper housing member 24 and a lower housing member 26 secured together by screws 27, which are received in cylindrical guides 28 in the lower housing member 26 and engage internally threaded bores in cylindrical guides 29 in the upper housing member 24. Housing 22 defines a handle grip and a button 30 is pivotally mounted in the housing for easy operation by hand grasping of housing 22. As best shown in Fig. 4, button 30 has parallel, flat side walls 32 and 34 extending from a top wall 36 and a cylindrical ear 38 protrudes transversely from the bottom of each side wall 32 and 34. Secured to the front end 40 of the top wall 36 by screws 44 is an elongate clip 42, as shown in Fig. 3. Top wall 36 slopes upwardly from front end 40 to a rear wall 46, which has an arcuate recess 48, and terminates at a stepped end 50. Upper housing member 24 has an opening 52 receiving button 30, stepped end 50 of rear wall 46 extends between a stop 54 to limit opening pivotal movement of button 30, and a stepped ledge having surfaces 56 and 58 is formed in upper housing member 24.

Upper housing member 24 has a pair of side walls 60 with a recess 62 formed in each side wall. Each recess 62 has arcuate ends with a line connecting the centers of curvature thereof disposed at an angle to the longitudinal axis of steam curling iron 20. Similarly, lower housing member 26 has a pair of side walls 64, each of which has a recess 66 formed therein with arcuate ends aligned with the arcuate ends of recess 62. Recesses 62 and 66 cooperate to form channels 68 extending angularly away from the axis of the curling

iron. Channels 68 have a sufficient width to slidably receive ears 38 of button 30, such that the button can be pivoted on ears 38 and moved away from the axis of the curling iron by applying a force to rear wall 46 in parallel with the axis of the curling iron, thereby causing ears 38 to ride up in the channels.

A flat spring 70 is provided, which has an S-configuration, as shown in Fig. 3, and is mounted to bias button 30 in a counter-clockwise direction. Spring 70 has a curved end 72 anchored at the stepped end 50 of button 30 and an end 74 bent twice, as shown in Fig. 5, to be anchored in an opening 76 formed in upper housing member 24. Stepped end 50 of button 30 has a downwardly depending lip 78 which cooperates with a rib 80 to hold end 72 of spring 70 in place, such that spring 70 not only biases button 30 out of the housing 22, but also biases button 30 toward the rear of the housing to hold ears 38 resiliently in the lower rear ends of channels 68. Referring particularly to Fig. 1, housing 22 has an opening 82 in the rear end thereof receiving a plug 83 carrying electrical wires 84 and 86, which are connected in series through a ceramic, resistance wire heating element 88, a thermostat 90, and a fusible link 92 with a neon lamp 94 connected in parallel therewith. Neon lamp 94 is held in a receptacle 96 at the top of upper housing member 24 adjacent button 30 and is covered by a colored lens 98, such that when electricity is supplied to steam curling iron 20, the lamp 94 will be energized and visible through lens 98.

At the front end of housing 22, lower housing member 26 has an inwardly turned lip 100 contacting an outer tubular member 102, which has holes in a proximal end 104 thereof receiving the cylindrical guides 28 and 29 of the upper and lower members. An inner tubular member 106 similarly has holes in a proximal end 108 for mounting of cylindrical guides 28 and 29 of housing 22. Outer tubular member 102 forms a tubular body for the curling iron and has a hair winding portion 110 surrounding a heating chamber 112. Inner tubular member 106 terminates at a distal end 114 of heating chamber 112 and supports thereat heating element 88, which has a cylindrical tubular configuration. Heating element 88 has a bore 116 therein mounting a shank 118 of a tip heater 120 having a head hermetically sealed to the distal end 114 of the inner tubular member 106 in any suitable manner, such as brazing. Tip heater 120 is made of a high heat conducting metal, such as copper, and shank 118 is in thermal contact with heating element 88 such that the head of the tip heater reaches a temperature closely ap-

proximating the temperature of the heating element, which is well in excess of 100°C. At the other end of bore 116, a small diameter leg 123 of a spring clip 124 is mounted in good mechanical contact with the inner diameter of the bore. Spring clip 124 has a large diameter leg 126 mounting the thermostat 90, which may be a conventional bimetal switch, and the fusible link 92. Spring clip 124 is preferably constructed of a spring metal, such as phosphor bronze or beryllium copper, in order to make good contact with heating element 88, thermostat 90 and fusible link 92 for maximum heat conduction. Inner tubular member 106 is spaced from outer tubular member 102 such that outer tubular member 102 is heated by radiation rather than conduction to permit operation of the heating element at higher temperatures required to generate steam and a seal is formed between the outer and inner tubular members by a gasket 128. The heater, a fusible link and thermostat assembly is secured within tubular member 106 to seal the end of the heating element by a high temperature, silicon rubber 130, which provides a water-tight assembly.

The hair winding portion 110 of the tubular body has a plurality of longitudinal axial grooves 132 formed therein, each of the groove having apertures 134 disposed therealong, as best illustrated in Fig. 2. Grooves 134 are formed with side walls with the apertures disposed in the side walls such that vapors exit from heating chamber 112 through apertures 134 in a direction at an angle to the radial direction and almost tangential to prevent scorching of the scalp of a user. Grooves 132 permit distribution of vapors when hair is tightly wound around the hair winding portion 110. The outer tubular member 102 is preferably made of stainless steel or other metallic material treated to inhibit corrosion and the outer surface thereof is preferably coated with a friction reducing material, such as for example polytetrafluoroethylene.

Referring again to Fig. 3, elongate clip 42 extends along the tubular body and is curved in cross-section to make intimate contact therewith. Clip 42 has an elongated slot 136 in the central portion thereof to permit steam to reach successively wound layers of hair and clip 42 is preferably coated with a friction reducing material such as polytetrafluoroethylene.

Clip 42 also has a step 138 at the proximal end thereof secured to button 30 by screws 44. The clip is normally biased against the hair winding portion 110 of outer tubular member 102 and can be pivoted away from the hair winding portion by depressing button 30, while being

movable away from the hair winding portion 110 in a direction transverse to the longitudinal axis thereof by sliding movement of the ears 38 of the button 30 in channels 68.

Referring again to Fig. 1, the iron further includes a device for delivering liquid to be vaporized to heating element 88. The delivery device, generally indicated at 300, includes a liquid supply member 302 and a liquid delivery control device, generally indicated at 500.

As shown in Figs. 6 and 7, supply member 302 is a press fit on to the tubular body of the iron so that distal end 142 of member 102 abuts annular shoulder 304 formed in the periphery of member 302. A sleeve 310 surrounds a reservoir defining member 312 and is fixed to an annular shoulder 314 of supply member 302 and to member 312. Defined by supply member 302 and member 312 is a small diameter chamber 306 with a central cylindrical chamber 308 therein. Carried in chamber 306, as shown in Fig. 1, is a piston 326 slidably axially on a plunger 322 longitudinally oriented in delivery device 300. Biased away from piston 326 by a compressed, coiled spring 328 is a cap 316, which is threaded into member 312. At the end of plunger 322 furthest from heating chamber 112, head 320 of plunger 322 is positioned for movement inwardly into a recess 318 of cap 316 and is biased therefrom by a spring 321. Referring again to Figs. 6 and 7, the other end of plunger 322 carries a piston 324, which is movable through chambers 306 and 308 to push liquid from the reservoirs through the supply member and into the heating chamber.

In communication with chamber 308 is a passage 330 in supply member 302. A valve 336 is resiliently biased against a valve seat 338 of passage 330 by a coiled spring 340, which spring is compressed between valve 336 and device 500.

The liquid delivery control device 500 is disposed in the iron between supply member 302 and heating chamber 112. This device has portions defining a bore 501 through which a liquid delivery tube 502 is inserted for axial movement in the bore. Tube 502 has one end adjacent valve 336 and the other end adjacent heating chamber 112, the latter end being provided with a flange portion 503. Mounted about flange portion 503 is a bimetallic disc 504.

It should be understood that the term "bimetallic disc" is intended to encompass bimetallic elements in general and not just those in the form of a disc. Other bimetallic elements, for example, are coils and strips. Most important whatever element is utilized, the metals of which the element is

made ~~should~~ have rates of expansion and contraction, upon being heated and cooled, which cause the element to change its shape. Representative materials useful in the manufacture of the bimetallic disc of this invention include the materials mentioned above in connection with the bimetal switch of thermostat 90.

Upon being heated or cooled, disc 504 changes shape, thereby causing movement of tube 503. As shown in Fig. 6, when disc 504 has a generally convex shape, the end of tube 503 is spaced from valve 336. Thus, although the valve is resiliently biased against seat 338 by spring 340, the pressure of liquid thereagainst, if the dispensing device were operated, would allow liquid to be delivered into chamber 112 through tube 503. As shown in Fig. 7, when disc 504 has a generally concave shape, the end of tube 503 contacts valve 336 to close the valve. Although the dispensing device may be operated to deliver liquid into passage 330, the pressure of the liquid would not be sufficient to open valve 336, thereby preventing the dispensing of liquid into heating chamber 112.

To utilize the temperature responsive character of disc 504 to regulate liquid delivery through passage 330 into chamber 112, the metals of which the disc is made are chosen in accordance with the particular temperature at which their rate of expansion or contraction causes a change in their shape. Generally, it will be desirable that the temperature at which disc 504 changes its shape will be the same as or in correspondence to the temperature required for liquid vaporization by heating element 88. Although a second heating means could be utilized to heat disc 504 to a particular temperature in correspondence to a measured temperature attained by element 88, the disc is preferably heated directly by element 88, so that when the element has reached the required vaporization temperature, disc 504 changes shape to that shown in Fig. 6 and allows liquid delivery into chamber 112.

To use the iron, liquid dispensing device 300 is first filled. Cap 316 is unscrewed from member 312 and the reservoir is filled with a liquid to be vaporized. Plunger 322 is then inserted in the reservoir and the cap is again screwed into member 312.

The iron is then heated to a desired temperature, preferably between 60 and 140°C. The temperature of heating element 88 is controlled by thermostat 90 in a conventional manner with fusible link 92 providing protection against damage to the hair if a high limit temperature is reached by the heating element, such as due to malfunction or failure of thermostat 90. Neon lamp 94 will be energized to signify

to the user that the steam curling iron is being heated and, if desired, the neon lamp can be connected with the thermostat 90 or a suitable timing device such that it is energized only when steam curling iron 20 has reached the desired temperature.

With the steam curling iron at the desired temperature, a tress of hair to be set is wound around the hair winding portion 110 of tubular body 102. The end of the tress is clamped to hair winding portion 110 by depressing button 30 to pivot clip 42 away from the hair winding portion, placing the end of the tress under the clip, and then releasing the button to permit the bias from spring 70 to hold the hair against the hair winding portion. The position of the button and clip is limited by engagement of stepped end 50 of the button with surface 58 of the upper housing member 24. The entire tress is then wound around the steam curling iron over the clip 42 by rotation of the curling iron, it being appreciated that while the hair is being wound around the already heated curling iron 20, the moisture content of the hair is being reduced. After the hair has been completely wound about the hair winding portion, the user merely depresses head 320 into the recess 318 of the cap to move piston 324 in chamber 308 and discharge a predetermined quantity of the liquid to be vaporized through passage 330. Piston 324 forms with supply member 302 a pump for discharging a metered amount of liquid. The force from depression of the plunger overcomes the bias of spring 340 to move valve member 336 away from valve seat 338 and permit the liquid to be moved through liquid dispensing tube 502 into heating chamber 112, as shown in Fig. 6, for evaporation and application to the hair through tangential apertures 134 in the side walls of axial grooves 132. The vaporized liquid penetrates and plasticizes the hair wound around the steam curling iron and passes through the slot 136 in the clip 42 for access to the hair wound thereabove.

When the plunger is released, the force from spring 321 will return the plunger to its initial position, and the pressure from spring 328 will fill chamber 308 with fluid for the next application. It should be appreciated that the force from spring 328 is not sufficient to overcome the force from spring 340 to open the valve.

However, if in the above operation heating element 88 does not attain the required temperature or the temperature of the element decreases below that temperature, then disc 504 does not change its shape to that one shown in Fig. 6 and no liquid is delivered past valve 336 because of the closing of this valve by tube 502. Not until the heating element attains the correct tem-

perature will tube 502 be moved out of contact with valve 336 to allow liquid delivery into chamber 112.

Therefore, although a user may operate 5 plunger 322 to push liquid into passage 330, the iron will not operate to emit steam outside the prescribed limit.

It is contemplated that the operation of 10 device 500 can be indicated to the user by a neon light, such as 94 above, or other conventional indicating means to show the user when the heating element is sufficiently heated and the iron is ready for operation.

15 Within a period of from 5 to 15 seconds, normally 10 seconds, the heat from the tubular body will evaporate the moisture applied to the hair to set the curl. The user then unwinds the tress of hair for one 20 half turn and applies a force to the rear wall 46 of button 30, facilitated by gripping arcuate recess 48, to cause the ears 38 of the button to ride up in the channels 68 inclined to the axis of the tubular body such 25 that the clip 42 will be moved transversely to the longitudinal axis of the tubular body to a position in parallel with the air winding portion and spaced approximately 1/ 30 16" therefrom, as shown in Fig. 3. The stepped end 50 of the button 30 will now be moved to engage surface 56 of the upper housing member 24 to thereby place the button and clip in a stable position, 35 and the wound tress of hair can now be easily, axially removed from the curling iron without interference from the clip 42.

From the above, it will be appreciated 40 that the coaxial alignment of the liquid dispensing devices with the tubular body of the steam curling iron at one end thereof facilitates operation of the metering 45 mechanism to supply a predetermined amount of vaporized liquid to the hair without interfering with axial removal of the hair after setting. Furthermore, the 50 support for the elongate clip 42 to permit both pivotal and parallel movement thereof relative to the tubular body provides full utilization of the clip as a retainer to clamp the end of a tress of hair prior to 55 winding about the steam curling iron without presenting an obstacle to axial removal of the hair after setting.

Inasmuch as the present invention is 60 subject to many variations, modifications and changes in detail, it is intended that all matter described above or shown in the accompanying drawings be interpreted as illustrative and not in a limiting sense.

60 WHAT WE CLAIM IS:—

1. A steam curling iron having a liquid 65 reservoir, a vaporization chamber having means for vaporizing the liquid, means for delivering the liquid to be vaporized from the reservoir to the vaporization chamber,

and heat-responsive closure means for selectively blocking the movement of liquid from the reservoir to the vaporization chamber.

2. A steam curling iron according to 70 Claim 1, wherein the heat-responsive closure means allows movement of liquid to the vaporization chamber when the temperature therein is sufficient to vaporize the liquid and blocks movement of the 75 liquid to the vaporization chamber when the temperature therein is insufficient to vaporize the liquid.

3. A steam curling iron according to 80 Claim 1 or 2, wherein the said closure means includes a bimetallic element.

4. A steam curling iron according to 85 any one of Claims 1 to 3, wherein the means for delivering the liquid from the reservoir to the vaporization chamber comprises a valved conduit and the heat-responsive closure means comprises a 90 bimetallic disc, having the property of changing its shape when heated to a particular temperature which is the same as, or corresponds to, the minimum temperature required for vaporizing the liquid 95 and a fluid delivery tube, through which liquid may be delivered from the valved conduit into the vaporization chamber, the tube being fixedly attached to the disc and 100 movable thereby both in and out of contact with the valve, upon change of shape of the disc, to close and open the valve, whereby the tube contacts the valve when the disc is in an unheated condition, to 105 prevent liquid delivery therethrough, and is moved out of contact with the valve when the disc is in a heated condition, to allow liquid delivery therethrough into the vaporization chamber, so that the control 110 device prevents liquid from being delivered to the vaporization chamber until the vaporization means reaches the minimum required temperature.

5. A steam curling iron according to 115 Claim 4 wherein the disc is made of two distinct layers of metal joined together, the metal of each layer expanding and contracting upon being heated and cooled to change the shape of the disc.

6. A steam curling iron according to 120 Claim 4 or 5 wherein the liquid delivery tube has a flange portion on which the disc is journaled.

7. A steam curling iron according to 125 any one of the preceding claims wherein the vaporization chamber is a heating chamber having a heating element therein.

8. A steam curling iron according to 130 any one of the preceding claims wherein the means for delivering the liquid from the reservoir to the vaporization chamber comprises a pump.

9. A steam curling iron according to 135



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perature will tube 502 be moved out of contact with valve 336 to allow liquid delivery into chamber 112.

Therefore, although a user may operate 5 plunger 322 to push liquid into passage 330, the iron will not operate to emit steam outside the prescribed limit.

It is contemplated that the operation of 10 device 500 can be indicated to the user by a neon light, such as 94 above, or other conventional indicating means to show the user when the heating element is sufficiently heated and the iron is ready for operation.

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From the above, it will be appreciated that the coaxial alignment of the liquid 40 dispensing devices with the tubular body of the steam curling iron at one end thereof facilitates operation of the metering mechanism to supply a predetermined amount of vaporized liquid to the hair 45 without interfering with axial removal of the hair after setting. Furthermore, the support for the elongate clip 42 to permit both pivotal and parallel movement thereof relative to the tubular body provides full 50 utilization of the clip as a retainer to clamp the end of a tress of hair prior to winding about the steam curling iron without presenting an obstacle to axial removal of the hair after setting.

Inasmuch as the present invention is 55 subject to many variations, modifications and changes in detail, it is intended that all matter described above or shown in the accompanying drawings be interpreted as illustrative and not in a limiting sense.

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and heat-responsive closure means for selectively blocking the movement of liquid from the reservoir to the vaporization chamber.

2. A steam curling iron according to 70 Claim 1, wherein the heat-responsive closure means allows movement of liquid to the vaporization chamber when the temperature therein is sufficient to vaporize the liquid and blocks movement of the 75 liquid to the vaporization chamber when the temperature therein is insufficient to vaporize the liquid.

3. A steam curling iron according to 80 Claim 1 or 2, wherein the said closure means includes a bimetallic element.

4. A steam curling iron according to 85 any one of Claims 1 to 3, wherein the means for delivering the liquid from the reservoir to the vaporization chamber comprises a valved conduit and the heat-responsive closure means comprises a 90 bimetallic disc, having the property of changing its shape when heated to a particular temperature which is the same as, or corresponds to, the minimum temperature required for vaporizing the liquid and a fluid delivery tube, through which 95 liquid may be delivered from the valved conduit into the vaporization chamber, the tube being fixedly attached to the disc and movable thereby both in and out of contact with the valve, upon change of shape of the disc, to close and open the valve, whereby the tube contacts the valve when 100 the disc is in an unheated condition, to prevent liquid delivery therethrough, and is moved out of contact with the valve when the disc is in a heated condition, to allow liquid delivery therethrough into the 105 vaporization chamber, so that the control device prevents liquid from being delivered to the vaporization chamber until the vaporization means reaches the minimum required temperature. 110

5. A steam curling iron according to 115 Claim 4 wherein the disc is made of two distinct layers of metal joined together, the metal of each layer expanding and contracting upon being heated and cooled to change the shape of the disc.

6. A steam curling iron according to 120 Claim 4 or 5 wherein the liquid delivery tube has a flange portion on which the disc is journaled.

7. A steam curling iron according to 125 any one of the preceding claims wherein the vaporization chamber is a heating chamber having a heating element therein.

8. A steam curling iron according to 130 any one of the preceding claims wherein the means for delivering the liquid from the reservoir to the vaporization chamber comprises a pump.

9. A steam curling iron according to 135

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any one of the preceding claims wherein the vaporization chamber has apertures through which vaporized liquid is emitted from the device.

5 10. A steam curling iron according to claim 1 substantially as described herein.

11. A steam curling iron according to claim 1 substantially as shown in the ac-

companying drawings and described herein with reference thereto.

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