

SPECIFICATION

Curler brush

5 The present invention relates to a lockable rotatable heated curling brush which is used for styling and curling hair. More particularly, this invention relates to a rotatable heated curling brush having a housing which serves as a handle, an inner tube
10 fixedly connected to said housing and protruding therefrom, a heater inside said inner tube electrically connected to a swivel cord, and an outer tube rotatably supported by said inner tube, said outer tube having a round brush on the outer surface
15 thereof. The inner tube is fixed to the housing by a through bolt near its rearmost end. The outer tube is held in the housing by a circular guide in the front end of the housing which mates with a notched flange at the rear of the outer tube. This flange has
20 notches which in conjunction with a spring latch device, attached pivotally to the inner tube, holds the round brush fast or releases it to freely rotate. The outer tube is supported by the inner tube and held captive by an inward facing groove on the front edge
25 of the housing which mates with the notched flange. The front end of the outer tube is supported by the front end of the inner tube. The inner tube within the outer tube is aluminium and is in heat conducting relationship with the heater and the outer tube. The
30 heater is placed in the inner tube and the inner tube is placed in the outer tube so that maximum uniform heating of the outer tube and brush occurs. The preferred heater is a positive temperature coefficient (PTC) thermistor.

35 Known curlers with lockable rotatable heated brushes having heating units in the inner tube are characterized as having the inner tube and outer tube made from heat conductive material such as fiberglass filled polyamide. The inner and outer
40 tubes are made of the same material and thus have the same coefficient of expansion, thus assuring that the rotatability of the brush is not adversely affected. We have found, however, that the distribution of heat in such curler brushes is uneven, being hotter in
45 the centre and cooler on the ends, thus adversely affecting the performance of the curler. There is a need, therefore, to improve the heat distribution on the curling brush.

Accordingly, it is an object of this invention to
50 provide an improved heated lockable, rotatable curler brush having means to provide uniform heat distribution in the curler brush.

The heated curler brush of this invention comprises a housing which serves as a handle, a plastic
55 outer tube supporting curler brush and an aluminium inner tube. The inner tube is made of rigid aluminium and is fixedly connected to said housing and protrudes therefrom a heater, preferably a positive temperature coefficient heater, is inside said
60 inner tube positioned so that maximum uniform heating of the outer tube and brush occurs. This position is such that the axial center of the heater is forward of the longitudinal center of the inner tube at a point which offsets the unequal heat loss rate to
65 the atmosphere from the center and ends of the

outer tube. The heater is connected by electrical contacts to a swivel cord in the housing. The inner tube can be all aluminum or the aluminum portion can extend from the connection in the housing to the
70 front end or can be only the portion protruding from the housing. The outer tube with a round brush thereon is rotatably supported on the inner tube and is in heat conduction relationship therewith. The inner tube is fixed to the housing by a through bolt near its rearmost end. The outer tube is held in the housing by a circular guide in the front end of the housing which mates with a notched flange at the rear of the outer tube. The flange has notches which
75 in conjunction with a spring latch device, attached pivotally to the inner tube, holds the round brush fast or releases it to freely rotate. The outer tube is supported by the inner tube and held captive by an inward facing groove on the front edge of the housing which mates with the notches flange. The front end
80 of the outer tube is supported by the front end of the inner tube. The inner tube extends substantially the whole length of the outer tube.

FIGURE 1 is an axial section of the heated curling brush of this invention;

90 FIGURE 2 is a top elevational view of the curling brush of FIGURE 1;

FIGURE 3 is a front view of the curling brush of FIGURE 1; and

95 FIGURE 4 is an exploded view in perspective of the curling brush of FIGURE 1.

Referring to the drawings, the heated hair curler as shown in FIG. 1 comprises a housing 1 which serves as a handle, and inner tube 2 made of aluminum protruding from the housing 1. The inner tube 2 can
100 be all aluminum or can be aluminum from at least the portion protruding from the housing 1. The inner tube 2 can be made by deep drawing, extrusion or other means. The inner tube 2 is attached fixedly to the housing 1 by means of a post 22 on the inner surface of the housing 1 through a hole 2a in the
105 inner tube 2.

The inner tube serves to rotatably support an outer tube 3 and to conduct heat from the heater 6 to the outer tube 3. The coupling 5, shown in more detail in
110 FIG. 4, between housing 1 and the outer tube 3, holds the round brush 4 supported by the outer tube 3 by a circular guide 5a in the front of housing 1 which mates with a notched flange 3a at the rear of the outer tube 3. The electric heating device 6 is a PTC thermistor located forward of the longitudinal
115 center of the inner tube 2. The heating device 6 is connected to a power source, not shown, by electric cord 7 which is introduced into the housing 1 and connected at commutating device 9 by wires 10 extending from the PTC thermistor 6 into housing 1
120 to a swivel coupling 8.

The outer tube 3 and round brush 4 consist of a heat conductive material which has a coefficient of heat expansion compatible with the aluminum of the
125 inner tube 2, for example, polyamide containing a fibreglass filling.

The inner tube 2 has a blind front end 2b which provides an axial forward stop for the heater 6. This blind front 2b on the inner tube 2 abuts the blind
130 front end 14 of the outer tube 3 at a position farther

forward than in prior devices so that the inner tube 2 is substantially in the whole length of outer tube 3. The outer diameter of the inner tube 2 is close fitting within the inner diameter of the outer tube 3 to maintain maximum heat transfer. These diameters may be very close fitting and still permit free rotation of the outer tube 3 in view of the compatible coefficients of thermal expansion of the plastic outer tube 3 and aluminum inner tube 2. The outer tube 3 has an unheated grip 15 on its front end. The rear end of the outer tube 3 is a flange 16 as shown in FIG. 4 with latching notches 17 into which a coupling key 18 with a coupling nose 19 can be engaged. The coupling key 18 is pivotally supported on the inner tube 2 between the outer tube 3 and housing 1 at pivot axis 21. The coupling key 18 is supported against the inner tube 2 with a compression spring 20. In this way, the coupling nose 19 is automatically swung into coupling position to hold the outer tube 3 fast until the operator actuates the coupling key 18 for disengagement, then the outer tube 3 and round brush 4 rotate freely. The inner tube 2 preferably has a pivot axis 21 thereon for the coupling key 18. The coupling key 18 is also pivotally supported on the housing 1 by depression 24 and 25 therein, shown in FIG. 4.

The heated lockable rotatable curling brush, in

use, operates as follows. The operator releases the outer tube 3 and round curler brush 4 by pushing the coupling key 18 and winds the hair around the curler brush 4 while rotating outer tube 3 and the curler brush 4. When the hair is wound up to the desired degree, the coupling key 18 is released, locking the rotating brush 4, and the electric plug, not shown, is plugged into an electric power source which heats the PTC heater 6 causing the aluminum inner tube 2 to become heated by conduction and the outer tube 3 and round brush 4 thereon to also become heated by conduction. When the hair is curled as desired, the coupling key 18 is pushed releasing the outer tube 3 and round brush 4 to rotate freely. The curler brush is then pulled outward from the head, releasing the hair.

In order to demonstrate the effect of the aluminum inner tube 2 and the placement of the PTC heater 6 on the uniformity of temperature on the rotating curler brush 4, the following tests were conducted.

In each case the curling brush was heated until the temperature stabilized. The first series was run on the known curling brush manufactured by WIK Electro-Hausgerate Vertriebs GmbH & Co. of West Germany under the name Rollomatic-Brush in which the inner tube is the same material as the outer tube.

Using 120 volts, the temperature was measured as shown in the following tables.

TABLE 1

Input 120V, Ambient Temperature 23°C.

Outer Tube Temps

Time On	1-1/4" from center towards tip - TC #1	Center TC #2	1-1/4" from center towards handle - TC #3
1 min.	23°C	38°C	30°C
2 min.	24°C	61°C	47°C
3 min.	26°C	78°C	62°C
4 min.	29°C	89°C	72°C
5 min.	31°C	93°C	80°C
10 min.	42°C	113°C	97°C
stabilized temp.	47°C	118°C	102°C

TABLE 2

Outer Tube Temps

Time On	1-1/4" from center towards tip - TC #1	Center TC #2	1-1/4" from center towards handle - TC #3
1 min.	23°C	42°C	28°C
2 min.	24°C	70°C	45°C
3 min.	28°C	87°C	60°C
4 min.	31°C	98°C	72°C
5 min.	36°C	106°C	77°C
10 min.	47°C	120°C	96°C
stabilized temp.	53°C	126°C	101°C

The data in Tables 1 and 2 demonstrate that the use of the plastic inner tube and the location of the heater results in very uneven heat distribution in the outer tube and brush.

TABLE 3

Plastic inner tube was replaced with an aluminum tube located same as plastic.

Amb. Temp. 23°C, input 120V

5 TC #1 - 1-1/4" from outer tube center towards tip

TC #2 - outer tube center

TC #3 - 1-1/4" from outer tube center towards handle

10

Outer Tube Temps. °C

Time On	TC #1	TC #2	TC #3
1 min.	25°C	48°C	36°C
90 sec.	26°C	62°C	47°C
2 min.	28°C	76°C	57°C
3 min.	31°C	93°C	74°C
4 min.	35°C	104°C	86°C
5 min.	39°C	113°C	95°C
6 min.	42°C	118°C	101°C
7 min.	44°C	122°C	106°C
8 min.	46°C	125°C	109°C
9 min.	48°C	127°C	113°C
10 min.	49°C	128°C	114°C
15 min.	51°C	130°C	115°C

This test indicated that the aluminum raises the outer surface temperature through better heat conduction, but showed that heat is being lost at the

15 front end of the outer tube due to exposure of larger surface areas to the ambient atmosphere.

TABLE 4

20 The outer tube was bored out to allow the aluminum tube and heater used in Table 3 to be pushed 5/8" further into the outer tube (5/8" beyond original position).

Result:

25 Amb. Temp. 23°C, input 120V

TC #1 - 1-1/4" from outer tube center towards tip

TC #2 - barrel center

TC #3 - 1-1/4" from outer tube center towards handle

30

Outer Tube Temps. °C

Time On	TC #1	TC #2	TC #3
1 min.	47°C	40°C	28°C
90 sec.	63°C	55°C	35°C
2 min.	76°C	67°C	43°C
3 min.	92°C	86°C	58°C
4 min.	104°C	98°C	70°C
5 min.	110°C	106°C	78°C
6 min.	116°C	113°C	84°C
7 min.	119°C	116°C	88°C
8 min.	121°C	118°C	90°C
9 min.	123°C	122°C	93°C
10 min.	123°C	122°C	94°C
15 min.	127°C	126°C	99°C

This test indicated that the aluminum tube and heater had been moved too far forward since the outer tube was cooler in the portion on the handle end of the center.

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TABLE 5

Using the same bored out outer tube as in Table 4, the aluminum tube and heater were pushed 7/16" further into the outer tube (7/16" beyond the original position but 3/16" less than in the test shown in Table 4).

40

Amb. Temp. 23°C, input 120V

TC #1 - 1/4" from outer tube center towards tip

45

TC #2 - outer tube center

TC #3 - 1-1/4" from outer tube center towards handle

Outer Tube Temps °C

Time On	TC #1	TC #2	TC #3
1 min.	43°C	42°C	35°C
90 sec.	58°C	57°C	49°C
2 min.	71°C	69°C	60°C
3 min.	88°C	88°C	78°C
4 min.	97°C	98°C	90°C
5 min.	105°C	107°C	98°C
6 min.	109°C	112°C	104°C
7 min.	114°C	117°C	109°C
8 min.	118°C	121°C	112°C
9 min.	118°C	121°C	114°C
10 min.	119°C	122°C	115°C
15 min.	121°C	125°C	119°C

50 The data in Tables 3, 4 and 5 demonstrate that the use of an aluminum inner tube results in improved heat distribution in the outer tube and brush and that when the inner tube and heater are moved further than previously but not too far into the outer tube even heat distribution and optimum results are obtained.

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The following tests were run using the WIK curling brush with different thicknesses of aluminum wrapped around the plastic inner tube but within the plastic outer tube. The results are shown after the temperatures stabilized.

60

TABLE 6

Tip End Degrees C	Center Degrees C	Handle End Degrees C
A. 0.1 MM thick Aluminum Sleeve		
48	118	92
B. 0.2 MM Thick Aluminum Sleeve		
55	120	101
77	125	104
C. 0.5 MM Thick Aluminum Sleeve		
68	116	107
D. 1.0 MM Thick Aluminum Sleeve		
96	125	111

After altering the outer tube to minimize the amount of heat drawn away from the surface, the following results were obtained using 0.2 MM aluminum.

5	Tip End	Center	Handle
	100°C	127°C	111°C

The data in Table 6 demonstrates that the use of aluminum wrapped around the plastic inner tube is superior to the plastic inner tube alone but is not as advantageous as the aluminum inner tube in which the heater and aluminum inner tube are positioned forward as compared to the prior art device.

15 CLAIMS

1. A heated lockable rotatable curling brush for styling and curling hair comprising:
 - a housing serving as a handle;
 - an inner tube made substantially of aluminum
- 20 fixedly attached to said housing, protruding therefrom; and rotatably supporting an outer tube;
 - a resistance heater in said inner tube in heat conduction relationship therewith wherein the axial center of the heater is positioned so as to offset the
- 25 unequal heat loss to the atmosphere from the center and ends of said outer tube; an electric cord in the inner tube connected to the heater and an outside power source;
 - A round brush supported on the outer tube, the
- 30 latter being rotatably supported on said inner tube and in heat conductive contact therewith, wherein said inner tube is in heat conducting contact with substantially the whole length of said outer tube;
 - a spring latch coupling mechanism between the
- 35 housing inner tube and outer tube at the front of the housing for locking the outer tube and rotatably releasing the outer tube.
 2. The curling brush of claim 1 wherein said heater is a positive temperature coefficient thermistor.
- 40 3. The curling brush of claim 1 or 2 wherein the outer tube has a notched flange into which a coupling nose of a coupling key pivotally attached to the inner tube and the housing can be engaged.
 4. The curling brush of claim 1, 2 or 3 wherein the axial center of the heater is forward of the longitudinal center of the inner tube.
- 45 5. The curling brush of any preceding claim wherein the outer tube is made of heat conductive material.
 6. The curling brush of any preceding claim wherein the outer tube is made of plastics material.
- 50 7. A curling brush as claimed in claim 1, substantially as described with reference to the accompanying drawings.



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 - 20 fixedly attached to said housing, protruding therefrom; and rotatably supporting an outer tube;
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 - 25 unequal heat loss to the atmosphere from the center and ends of said outer tube; an electric cord in the inner tube connected to the heater and an outside power source;
 - A round brush supported on the outer tube, the
 - 30 latter being rotatably supported on said inner tube and in heat conductive contact therewith, wherein said inner tube is in heat conducting contact with substantially the whole length of said outer tube;
 - a spring latch coupling mechanism between the
 - 35 housing inner tube and outer tube at the front of the housing for locking the outer tube and rotatably releasing the outer tube.
 2. The curling brush of claim 1 wherein said heater is a positive temperature coefficient thermistor.
 - 40 3. The curling brush of claim 1 or 2 wherein the outer tube has a notched flange into which a coupling nose of a coupling key pivotally attached to the inner tube and the housing can be engaged.
 - 45 4. The curling brush of claim 1, 2 or 3 wherein the axial center of the heater is forward of the longitudinal center of the inner tube.
 5. The curling brush of any preceding claim wherein the outer tube is made of heat conductive
 - 50 material.
 6. The curling brush of any preceding claim wherein the outer tube is made of plastics material.
 7. A curling brush as claimed in claim 1, substantially as described with reference to the accompanying
 - 55 drawings.