

DEFOGGING DEVICE FOR MIRRORS**Field of Invention**

This invention relates to a defogging device for mirrors, particularly but not
5 exclusively, for bathroom or spa mirrors.

Background of Invention

Nowadays, it is common to find water heaters in homes, especially in cold
10 climate countries. It is common knowledge that when a person showers or
bathes with hot water, the steam produced by the hot water would fog glass
surfaces, such as the surface of a mirror. As a result, there are mirrors
equipped with anti-fogging or anti-misting capabilities but such mirrors require
electrically conductive elements mounted in contact with the mirror, and when
15 electrical current passes through the conductive elements, this heats up the
conductive elements to defog the mirror. This may be an efficient way of
defogging a mirror but consumes electric power and thus, this is a rather
expensive solution. There is also the danger of leakage of the electrical current
and thus, the heating elements require regular maintenance to ensure that they
20 are properly insulated.

It is an object of the present invention to provide a defogging device which
addresses at least one of the disadvantages of the prior art and/or to provide
the public with a useful choice.



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Summary of Invention

In a first aspect of the invention, there is provided a defogging device for mirrors,
5 comprising: a thermal conductive member configured to be attached to a rear
surface of a mirror, and a thermal conductive pipe for carrying water from a hot
water unit, and arranged to be removably attached to the thermal conductive
member; wherein the thermal conductive member includes a channel
configured to at least partially embed the thermal conductive pipe.

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The term "defogging" is used in the context of this application to mean to
prevent or reduce the build up of mist or fog on the mirror surface and/or to
clear the mist or fog after it has been formed on the mirror surface.

15 Preferably, the thermal conductive member is substantially planar so that there
is greater surface contact with the mirror and for the heat transfer to be more
evenly distributed throughout the thermal conductive member. The thermal
conductive pipe may be generally U-shape and has a pair of legs with openings
which enable the water to pass through. With this configuration, the thermal
20 conductive member may include a further channel to form a pair of channels
configured to at least partially embed respective legs of the conductive pipe.

When attached, the thermal conductive pipe and the thermal conductive member are preferably slidable relative to each other, and this provides flexibility in adjusting the relative positions of the thermal conductive member and the pipe to suit different applications.

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It is preferred that the thermal conductive member and/or the thermal conductive pipe is made of copper.

The defogging device may include a mirror in the same package when sold or
10 the mirror may be provided as a separate item.

In a second aspect of the present invention, there is provided a method of installing the defogging device as described above, the method comprising the steps of: attaching the thermal conductive pipe to the channel of the thermal
15 conductive member; connecting the thermal conductive pipe to a water outlet of the hot water unit; and attaching the copper plate to the rear surface of a mirror.

The method may further comprise the step of attaching the thermal conductive member to an insulation member, wherein the insulation member is disposed
20 between the thermal conductive member and a wall to which the mirror is to be mounted.

The ability to adjust the relative positions between the thermal conductive member and pipe is an important aspect of the present invention, and this forms

a third aspect in which, there is provided a defogging device for mirrors, comprising a thermal conductive member configured to be attached to a rear surface of a mirror, and a thermal conductive pipe for carrying water from a hot water unit, and arranged to be slidably attached to the thermal conductive member. The thermal conductive member may include a channel configured to at least partially embed the thermal conductive pipe.

In a fourth aspect of the present invention, there is provided a method of installing the defogging device of the third aspect, the method comprising the steps of: (i) attaching the thermal conductive pipe to the channel of the thermal conductive member; and (ii) sliding the thermal conductive pipe or the thermal conductive member to adjust the relative position therebetween.

With the channel at least partially embedding the thermal conductive pipe, this increases the surface area for the transfer of heat from the hot water to the thermal conductive member. The defogging device of the present invention is inexpensive and simple to produce and install, and without compromising the functionality of fog prevention present in other known anti-fog devices.

As it would be appreciated from the described embodiment below, the defogging device of the present invention is able to defog mirrors or prevent build up of fog on mirrors effectively when taking a shower through the use of thermal energy obtained from the hot water unit used for bathing or showering. Thus, the hot water serves a dual purpose. In other words, it is not necessary to

use additional electrical power to heat the mirror. It will be appreciated that the defogging device may be used with mirrors that are deployed in areas which may cause fog or mist to form on the mirrors, such as in bathrooms, shower rooms, changing rooms, spa etc.

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Further, the defogging device performs its functions with minimal operational and maintenance costs.

Brief Description of the Drawing(s)

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An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is an unassembled view of a defogging device comprising a copper
15 plate and a copper pipe according to a preferred embodiment of the invention;

Figures 2 and 3 are front and rear views of the copper plate of Figure 1;

Figure 4 is an assembled, reduced size, view of the defogging device of Figure
1 and when the device is attached to an insulation member;

Figure 5 is an enlarged end view of Figure 4 in the direction A;

20 Figure 6 is a close up view of the insulation member of Figure 4;

Figure 7 shows the defogging device of Figure 4 in another orientation; and

Figure 8 shows the defogging device of Figure 4 when attached to a mirror (with a portion removed to show the defogging device more clearly);

Detailed Description of a Preferred Embodiment

Figure 1 is an unassembled view of a defogging device 100 according to a preferred embodiment of the present invention. The defogging device 100 comprises a thermal conductive planar member and a thermal conductive pipe. In this embodiment, the thermal conductive planar member is in the form of a copper plate 102, and the thermal conductive pipe is in the form of a copper pipe 104.

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As shown in Figure 1, the copper plate 102 is thin and substantially planar and has a first main surface 106 (hidden in Figure 1, but shown in Figure 2) and a second main surface 110. The copper plate 102 includes a pair of spaced apart channels 108 forged together with the copper plate with the longitudinal opening of the channels provided on the second main surface 110, as shown in Figure 3. The pair of channels 108 is substantially parallel with each other and generally has a C or U shape cross-section to adapt to the cross-section of the copper pipe 104. Likewise, the distance between the parallel channels 108 is configured to match the configuration of the copper pipe 104. The shape and size of the channels 108 are adapted to cooperate with the copper pipe 104.

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The copper pipe 104 is generally U-shape to form two legs 112, 114 with two open ends 112a, 114a one of which is adapted to be fitted to a water inlet such as to a hot water unit (not shown) to allow hot water from the water unit to fill the

copper pipe 104. The other open end is adapted to be fitted to a water outlet, for example to a hose of a shower head (not shown). The shape and size of the copper pipe 104 is so that the pipe 104 can be removably received within the respective channel 108, as will be described in more detail below.

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Figure 4 shows the defogging device of Figure 1 when assembled and the assembly is performed by sliding the ends 112a, 114a of the copper pipe legs 112, 114 into the respective channels 108 to form the assembled product of Figure 2. Each channel 108 receives the respective leg 112, 114 of the copper pipe 104 so that the portions of the copper pipe 104 engaged with the channels 108 are entirely embedded within the channels 108, as shown more clearly in Figure 5. It is envisaged that these portions of the copper pipe 104 need only be partially embedded within the channels 108, although it is preferred that these are entirely embedded within the channels 108.

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It should be appreciated that the channels 108 and the copper pipe 104 are dimensioned so that the copper pipe 104 fits snugly or is in friction fit with the channels 108 so that both parts are in optimal or perhaps maximum contact to enhance thermal conductivity. However, the cooperation between the channels 108 and the copper pipe 104 still allows adjustment of the position of the copper pipe 104 relative to the copper plate 102 by sliding one part relative to the other. Such flexibility is useful to adapt the defogging device 100 to different environments and applications, although the adjustability feature is not absolutely necessary.

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To install the defogging device 100, an opening is created in a wall on which the mirror 200 is to be mounted. Next, the defogging device 100 is assembled as explained above and as shown in Figure 4. Next, an insulation member 300
5 made of, for example, StyrofoamTM is used to insulate the defogging device from inner surface of the opening of the wall. The insulation member 300 has corresponding channels 302 formed which are configured to cooperate with the outer concave surface of the channels 108 of the copper plate. The cooperation between the channels 108 and the corresponding channels 302 of the insulation
10 member is such that both parts are in friction fit with each other in order for the copper plate 102 to support the insulation member 300 for example when the defogging device 100 is supported by the legs 112,114 of the copper pipe 104. The assembly is next placed in the opening with the insulation member 300 placed against the inner surface of the opening, and with the surface 110 of the
15 copper plate 102 facing outwards. The ends 112a,114a are next connected respectively to a water inlet and outlet so that water from a hot water unit passes through the one end and exits the copper pipe 104 through the other end. Thereafter, the mirror 200 with its rear facing the second main surface 110 of the copper plate 102 is attached to the wall and covering the opening by
20 using adhesive and the rear surface of the mirror 200 brought into thermal contact with the second main surface 110 of the copper plate 102. The final product is shown in Figure 8, without showing the wall for greater clarity.

In use, when a person turns on the hot water unit to take a shower or bath, the hot water travels through the copper pipe 104 and thermal energy from the hot water is transferred to the copper plate 102 via the legs 112, 114 and the channels 108. The thermal energy spreads through the planar surface of the copper plate 102 and in turn, the heated copper plate heats up the rear of the mirror thereby reducing fog formation on the mirror. Indeed, the present invention may be as effective in preventing fog from being formed on the mirror as clearing fog from a mirror after fog has formed.

With this arrangement, a simple and yet effective defogging of bathroom mirrors can be achieved. By at least partially embedding or receiving the copper pipe within the channels 108, a larger surface area of the channel surrounds the outer circumference of the copper pipe and this creates a greater surface area to conduct heat energy from the hot water to the copper plate 102 which increases the heat transfer efficiency.

With the mirror 200 mounted to the wall, this ensures that the rear surface of the mirror 200 is in direct contact with the copper plate 102 for greater heat transfer efficiency. The direct contact is certainly preferred but not essential.

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The simple and yet innovative configuration of the copper pipe means that there is no directional restriction in the sense that the copper pipe is usable in any orientation, such as in the orientation shown in Figure 7, depending on how the water is to be channeled to the water pipe. This is because the copper plate 102

is configured to be preferably in thermal contact with the legs of the copper pipe but not the bend of the U-shape copper pipe 104. Also, the length of the legs 112, 114 may be shortened depending on the application.

- 5 The presence of the insulation member 300 when installing the defogging device 100 is to insulate the heat from spreading to the wall. Of course, the insulation member is not necessary and may be omitted.

The described embodiment should not be construed as limitative. For example,
10 copper is used as the material for the thermal conductive member and the thermal conductive pipe for its good thermal conductivity but other thermal conductive materials may be used. The copper plate 102 may be adapted in different shapes and sizes to match to the shape and size of the mirror that the copper plate 102 is to be attached to. It may not be necessary for the copper
15 plate 102 to cover the entire rear surface of the mirror 200, but a substantial part of the mirror so that a larger surface of the mirror is defogged. If the copper plate 102 is not configured to cover a substantial part of the rear of the mirror 200 (for example, the mirror is very large), the copper plate 102 may be arranged to defog a selected area of the mirror depending on which part the
20 copper plate is attached to the mirror 200, for example, near the centre of the mirror. Likewise, the surface area of the insulation member 300 may be greater or smaller than the surface area of the copper plate 102 as long as the insulation member 300 can perform the function of insulating the adjacent wall from the heat.

In the described embodiment, the channels 108 are forged with the copper plate 102 and this is preferred so that the channels 108 are integrally formed with the copper plate 102.

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Having now fully described the invention, it should be apparent to one of ordinary skill in the art that many modifications can be made hereto without departing from the scope as claimed.

CLAIMS

1. A defogging device for mirrors, comprising:
a thermal conductive member configured to be attached to a rear surface
5 of a mirror, and
a thermal conductive pipe for carrying water from a hot water unit, and
arranged to be removably attached to the thermal conductive member;
wherein the thermal conductive member includes a channel configured to
at least partially embed the thermal conductive pipe.
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2. A defogging device according to claim 1, wherein the thermal conductive
member is substantially planar.
3. A defogging device according to claim 1 or 2, wherein the thermal
15 conductive pipe is generally U-shape and has a pair of legs with
openings which enable the water to pass through.
4. A defogging device according to claim 3, wherein the thermal conductive
member includes a further channel to form a pair of channels configured
20 to at least partially embed respective legs of the conductive pipe.
5. A defogging device according to any preceding claim, wherein, when
attached, the thermal conductive pipe and the thermal conductive
member are slidable relative to each other.

6. A defogging device according to any preceding claim, wherein the thermal conductive member is made of copper.
- 5 7. A defogging device according to any preceding claim, wherein the thermal conductive pipe is made of copper.
8. A defogging device according to any preceding claim, further comprising a mirror.
- 10 9. A method of installing the defogging device of any preceding claim, the method comprising the steps of:
 - (i) attaching the thermal conductive pipe to the channel of the thermal conductive member;
 - 15 (ii) connecting the thermal conductive pipe to a water outlet of the hot water unit; and
 - (iii) attaching the copper plate to the rear surface of a mirror.
- 20 10. A method according to claim 9 further comprising the step of attaching the thermal conductive member to an insulation member, wherein the insulation member is disposed between the thermal conductive member and a wall to which the mirror is to be mounted.

11. A method according to claim 9 or 10, wherein the method further comprises, after step (i), the step of adjusting relative positions between the thermal conductive pipe and the thermal conductive member.
- 5 12. A defogging device for mirrors, comprising
a thermal conductive member configured to be attached to a rear surface of a mirror, and
a thermal conductive pipe for carrying water from a hot water unit, and arranged to be slidably attached to the thermal conductive member.
- 10 13. A defogging device for mirrors according to claim 12, wherein the thermal conductive member includes a channel configured to at least partially embed the thermal conductive pipe.
- 15 14. A method of installing the defogging device of claim 12 or 13, the method comprising the steps of:
(i) attaching the thermal conductive pipe to the channel of the thermal conductive member; and
(ii) sliding the thermal conductive pipe or the thermal conductive member
20 to adjust the relative position therebetween.