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DRY SHAVING APPARATUS COMPRISING A SHAVING
HEAD WITH A COOLING SYSTEM

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2 Sheets-Sheet 1

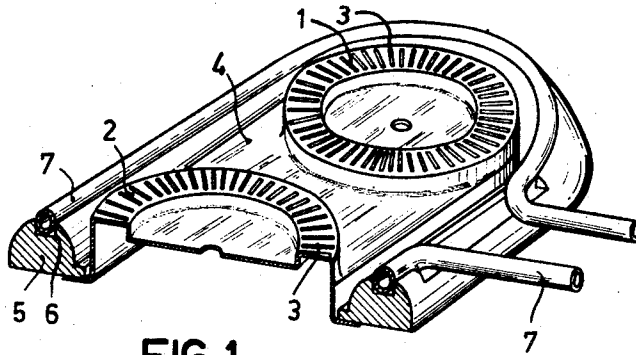


FIG. 1

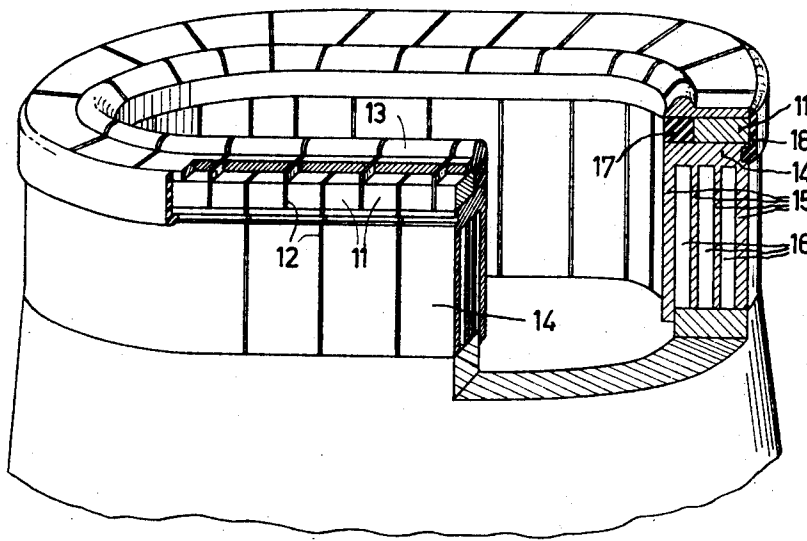


FIG. 2

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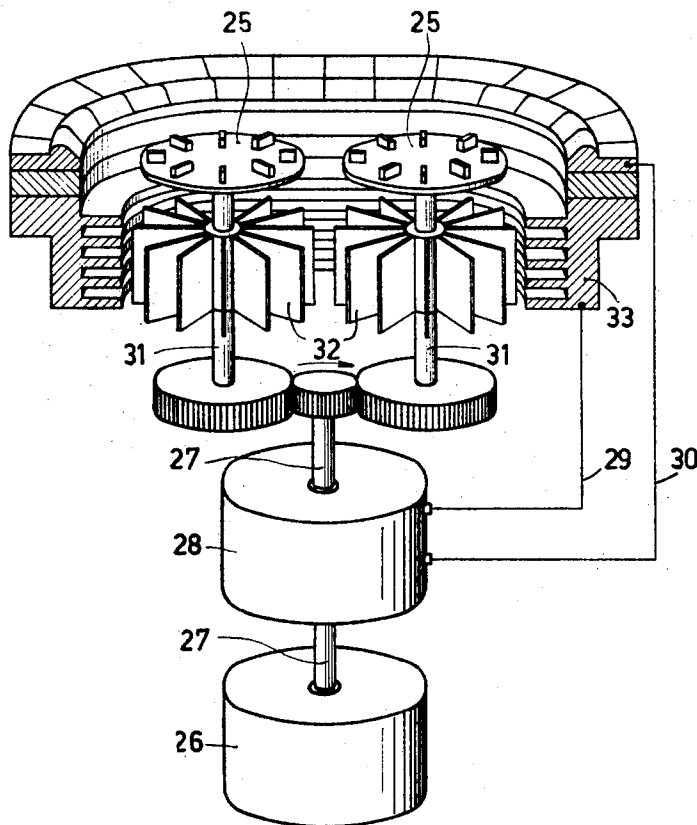


FIG. 3

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DRY SHAVING APPARATUS COMPRISING A SHAVING HEAD WITH A COOLING SYSTEM

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This invention relates to a dry shaving apparatus comprising a shaving head with a cooling system.

Dry shaving apparatus of this kind are already known. In a known embodiment the dry shaving apparatus comprises a ventilator by which air is sucked into the housing of the apparatus and subsequently blown away through narrow openings. These narrow openings are provided in the housing of the apparatus around the shaving head. Thus the skin to be shaved is swept by a forced stream of air about the area where the shaving head is in contact with the skin. This is intended to cool and dry the skin. The result depends upon the temperature of the air and upon the humidity of the air and of the skin. With this dry shaving apparatus, however, the shaving head is not prevented from being heated by the direct contact with the skin, since the very skin portion which is in contact with the shaving head cannot be cooled or dried by the forced air stream.

In a further embodiment the dry shaving apparatus also has a ventilator by means of which air is sucked through the openings of the shear plate into the apparatus. This is intended to avoid an increase in temperature which might be brought about by the friction between the shear plate and the shaving member and which would produce an unpleasant sensation on the skin. However, during the shaving operation the openings of the shear plate are wholly or partly closed by the skin to be shaved, so that the shear plate is cooled substantially only when the shaving head is not in contact with the skin to be shaved. The temperature of the shaving head of this dry shaving apparatus is therefore not likely to drop below the temperature of the skin or of the air during operation. Moreover, the effect is dependent upon the temperature of the air.

In accordance with the invention the shaving head is directly cooled to below the temperature of the skin or the air, independently of the temperature of the air and of the humidity of the air and the skin.

It has been found that a shaving apparatus constructed in accordance with the invention produces a particularly pleasant feeling on the skin, which is comparable to the refreshment obtained hitherto solely by using water and soap for shaving with a conventional blade. The lack of this agreeable effect in using the dry shaving apparatus has been the reason for many persons not to use dry shaving apparatus despite their many advantages in other respects.

It has been found that a drop of temperature to 10 or 20° C. suffices; a lower temperature of the shaving head may detract from the pleasant feeling for the individual user. It appeared, moreover, that it is not necessary to cool the whole surface of the shaving head which is brought into contact with the skin. If part of this surface is cooled in accordance with the invention, this is sufficient to produce the agreeable face skin refreshment.

In a simple embodiment of the invention the shaving head is provided around the shear plate with a cooling duct adapted to be connected with a container of a coolant. This container is preferably the water main.

In a further embodiment of the invention the shaving

head is cooled by the evaporation of a volatile substance which is in contact with the shaving head.

In order to perform a cooling irrespective of the availability of a coolant, for example tap-water or a rapidly evaporating substance, the shaving head is preferably provided, around the shear plate with Peltier elements, of which the cold joints cool at least part of the shaving-head surface to be brought into contact with the skin.

This known cooling method is particularly suitable for use in a shaving apparatus, since the desired temperature differences are not great so that this cooling system operates with satisfactory efficiency. The cooling capacity required is, moreover, very slight. The presence of a motor in the shaving apparatus provides, moreover, the possibility of supplying the required direct current to feed the Peltier elements in an attractive manner. The presence of the driving motor may furthermore be utilized for cooling the hot joints of the Peltier elements.

According to a further aspect of the invention the temperature increase at the hot joints is reduced in that the heat released at the hot joints is conducted away at least partly by the flow of air produced by the motor.

Since a dry shaving apparatus is operated only for a short time, the increase in temperature at the hot joints is reduced, in a preferred embodiment of the invention, by using, at least partly, the heat released at the hot joints for melting a substance which is in contact with the hot joints.

The melting point of this substance is to exceed as little as possible the maximum ambient temperature in order to reduce as little as possible the efficiency of the cooling system. Moreover, the quantity of substance is to be chosen in accordance with its melting heat in order to ensure that the total melting heat is sufficient for the effect to be maintained for the whole period of one shaving operation.

According to a further aspect of the invention the stator of the driving motor is constructed as a transformer for the supply current for the Peltier elements. Thus the required transformer can be accommodated without much difficulty in the conventional housing of a dry shaving apparatus. The alternating current thus obtained is to be rectified.

According to a further aspect of the invention the supply current for the Peltier elements may, however, also be produced by a direct-current generator housed in the dry shaving apparatus, for example, a unipolar generator.

In a further embodiment of the invention the supply current for the Peltier elements is produced by a thermoelectric generator.

The invention will now be described more fully with reference to the figures of the drawings.

FIG. 1 is a perspective, sectional view of a shaving head comprising a cooling duct with part thereof broken away.

FIG. 2 shows a part perspective and a part sectional view of a shaving head illustrating an alternative embodiment provided with Peltier elements and

FIG. 3 shows a variant of the shaving head of FIG. 2, and another alternative embodiment in which the Peltier elements are fed from a direct-current generator and the heat developed at the hot joints is conducted away by a flow of air produced by the motor.

Referring to FIG. 1, the shaving head of known type comprises two shear plates 1 and 2 having slits 3. These shear plates are mounted on a base plate 4, which is provided at the outer periphery with an elevated ring 5. With the base plate 4 this ring may be made from one piece of material. As an alternative, the ring 5 may be arranged as a separate unit around the base plate 4. At the top the ring 5 is provided with a groove 6 to ac-

commodate a tube 7, which is preferably made from material of good thermal conductivity. One of the ends of the tube 7 can be connected by means of a hose with the water main; the other end can also be connected by means of a hose with an outlet.

FIG. 2 shows the top part of the housing of a shaving apparatus, in which the shear plates and the cutters are to be accommodated. This is a modification of the structure illustrated in FIG. 1. The wall of this top part consists of series-connected Peltier elements 11, which may be made, for example, of bismuth-telluride Bi_2Te_3 , alternately of the p- and n-types. The elements 11 are insulated from each other by an insulating substance 12. On top of the apparatus the Peltier elements 11 are pairwise provided with plates 13 of good electrical conductivity, which constitute the cold joints of the Peltier elements and which, in common, cool part of the shaving head surface to be pressed against the skin, i.e. the part lying around the shear plates. On the lower side the Peltier elements 11 are pairwise provided with plates 14, which constitute the hot joints of the Peltier elements. The hot joints 14 are offset with respect to the cold joints 13. Thus the supply current traverses the Peltier elements in series i.e. from a hot joint 14 to a p-type Peltier element, then via a cold joint 13 to the adjacent n-type Peltier element and subsequently via a hot joint 14 to the next-following p-type Peltier element, and so on. For the current supply a transformer with a rectifier may be incorporated in the plug of the apparatus. However, as an alternative, the motor of the dry shaving apparatus may be employed as a transformer, the rectifier being then arranged in the housing of the apparatus.

The hot joints 14 are provided with cooling vanes 15, which constitute three uninterrupted, annular spaces 16. These spaces are filled with a substance of which the melting point exceeds as little as possible the ambient temperature. It may consist, for example, of capric acid which has a melting point of 30.5°C . and a melting heat of 38.9 cal./g . Both the hot joints 14 and the cold joints 13 are insulated from each other by synthetic substance. The melting substance must have a high electrical resistance to prevent a short-circuit of the Peltier elements. With a view to space saving it is furthermore desirable that during the melting process this substance should change its volume only little.

The heat transmission between the cold joints 13 and the skin may be controlled by providing the top side of the hot joints over part of their surface with a heat-insulating layer. For reasons of safety, the non-insulated

part is to be electrically insulated, for example, by lacquer to avoid a short-circuit of the Peltier elements by the skin.

Between the hot joints 14 and the cold joints 13 the Peltier elements 11 are covered by rings 17 and 18 of electric insulating material.

As is shown in FIG. 3, the cutting members 25 are driven by an electric motor 26. On the shaft 27 of the electric motor 26 is arranged the direct-current generator 28, which feeds the Peltier elements via conductors 29 and 30. The driving shafts 31 of the cutters 25 are provided with the ventilator blades 32, which blow a stream of air along the hot joints 33, of which the increase in temperature is thus counteracted.

What is claimed is:

1. A dry shaving apparatus comprising a shaving head provided with a shear plate, a plurality of Peltier elements having both hot and cold portions surrounding said shear plate, a plurality of separated chambers located adjacent to said hot portions thereof and in heat exchanging contact therewith, each having a cooling substance therein, said cold portions thereof being in communication with the shear plate to thereby withdraw the heat from the user's skin and thus cool the same.

2. A dry shaving apparatus comprising a shaving head provided with a shear plate, a plurality of Peltier elements having cold portions abutting the top surface thereof and hot portions abutting the bottom surface thereof, said Peltier elements surrounding said shear plate, insulating means between said hot and cold portions, a plurality of separated chambers located adjacent to said hot portions thereof and in heat exchanging contact therewith, said separations for said chambers being cooling vanes, each of said chambers having a cooling substance therein, said cold portions thereof being in communication with the shear plate to thereby withdraw the heat from the user's skin and thus cool the same.

3. A dry shaving apparatus as claimed in claim 2 wherein said cooling substance is capric acid.

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