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(54) **Shaving head and shaving apparatus comprising the shaving head**

Scherkopf und Rasierapparat mit einem dergleichen Scherkopf

Tête de coupe et rasoir comportant une telle tête

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Description

[0001] The invention relates to a shaving head comprising a cutter having a cutting edge for cutting hairs near the skin and a manipulator adapted to move a hair along the cutting edge.

[0002] Such a shaving head is known from US 2,568,047. The known shaving head comprises a cutter having a cutting edge for cutting hairs near the skin and a roller with V-shaped ribs on its periphery. Each rib extends circumferentially around the roller and substantially one-half of its circumference is inclined longitudinally in one direction of the axis of the roller and the other half of its circumference is oppositely inclined. The roller, while it is rotated by the skin during a cutting stroke, is shifted longitudinally of the cutting edge by an abutment which is fixed to the shaving head and has a terminal which extends between two ribs. The longitudinally moving roller moves the skin and the hairs along the cutting edge.

[0003] It is an object of the invention to provide a shaving head and shaving apparatus with an improved shaving result in comparison with the known shaving head. To this end the shaving head according to the invention is characterised in that the manipulator is adapted to move the hair relative to the skin while the hair is being cut by the cutting edge.

[0004] The load on a hair root depends on the force exerted on the hair by the shaving head. In this respect a distinction is to be made between shear-type shaving heads by which a hair is snapped off and knife-type shaving heads by which a hair is sliced off.

[0005] When a shear-type shaving head is used a hair is clamped between two edges which are movable relative to one another and which are subsequently moved towards one another, thereby subjecting the hair to shearing. Each of the edges exerts a substantial force on the hair but these forces are directed oppositely, as a result of which the shaving head exerts substantially no resultant force on the hair and the hair root is subjected to hardly any load.

[0006] When a knife-type shaving head is used a hair is severed in that a sharp edge exerts a force on the hair, without the hair being supported by the shaving head. When such a shaving head is used the force exerted on a hair by the shaving head is at least equal to the force required to move the cutting edge of the razor blade through the hair. This force is comparatively large, as a result of which a substantial load is exerted on the hair root.

[0007] The shaving head in accordance with the invention is a knife-type shaving head in which a movement of the hairs relative to the skin along the cutting edge is performed during cutting. As a result of this, the force required on a hair to move the cutting edge through the hair is comparatively small and the load to which the hair root is subjected is substantially smaller.

[0008] With the shaving head in accordance with the

invention the hairs move past the cutting edge with a higher speed than the skin so that there is a difference between the cutting action of the cutting edge with respect to the skin and the cutting action of the cutting edge with respect to the hairs. This is because at skin level hairs are movable relative to the skin. Factors such as the implantation of the hairs in the skin, the viscoelasticity of the skin and the frequency with which the hairs are moved can play a part, individually but also in different combinations. Owing to said difference in speed, the load exerted on the hair roots is reduced without an increased risk of skin injury.

[0009] The measures in accordance with the invention also ensure that during shaving the forces exerted on the cutting edge by the hairs in a direction transverse to the cutting edge are substantially smaller than with the known shaving head, which reduces the likelihood of deformation of the cutting edge. Moreover, a hair is brought into contact with different parts of the cutting edge, as a result of which the forces spread over a larger part of the cutting edge. This results in a more uniform wear of the cutting edge. In addition, a less sharp cutting edge yet provides satisfactory shaving results owing to the improved cutting action.

[0010] It is to be noted that US 4,118,863 discloses a hair trimmer having a movable blade and a stationary blade. Both blades have teeth to sever hairs caught between a tooth of the movable blade and a tooth of the stationary blade.

[0011] US 4,159,566 discloses a razor comb intended for hair styling by the individual. The known razor comb comprises a razor having a cutting edge and covered at both sides by a comb attachment. Different comb attachments of different lengths can be fitted to trim the hair at different lengths. The razor is drivable by an electric drive mechanism in a direction parallel to the cutting edge. The relative speeds of the razor with respect to the hairs and the skin are in principle equal.

[0012] An embodiment of the shaving head in accordance with the invention is characterized in that the manipulator is adapted to move hairs to and fro along the cutting edge. By means of this measure it is achieved, inter alia, that the range of movement of the hair relative to the skin is traversed several times during cutting of the hair, thereby enhancing the aforementioned effects.

[0013] An embodiment of the shaving head in accordance with the invention is characterized in that the shaving head comprises a supporting surface for supporting the shaving head on the skin, the shaving head comprises a frame, and the manipulator is movable relative to the frame in a tangential direction along the cutting edge. This embodiment has the advantage that the shaving head can be of simple construction. The hairs can be moved along the cutting edge by moving the manipulator in the tangential direction and bringing the manipulator into contact with the hairs.

[0014] An embodiment of the shaving head in accord-

ance with the invention is characterized in that the manipulator has recesses which extend near the cutting edge. A hair caught in one of the recesses will be moved in the tangential direction to some degree. Since the recesses extend near the cutting edge, for example disposed just underneath the cutting edge viewed from the supporting surface, the hair will perform a movement in the tangential direction at the instant that it contacts the cutting edge. The manipulator can be constructed, for example, as a foil provided with the recesses.

[0015] An embodiment of the shaving head in accordance with the invention is characterized in that in the tangential direction the recesses have a width between 100 and 400 micrometers. It has been found that in this range an optimum performance of the shaving head in accordance with the invention is achieved for regular hair thicknesses.

[0016] An embodiment of the shaving head in accordance with the invention is characterized in that the recesses are formed between teeth. As a result of the position of the teeth, hairs which engage with the cutting edge will at least partly come into contact with one or more teeth which move in the tangential direction. During this contact the manipulator and the relevant hairs interengage properly, as a result of which the hairs, when in contact, follow the movement of the manipulator and the relative speed of the hairs with respect to the cutter is equal to the relative speed of the manipulator with respect to the cutter.

[0017] An embodiment of the shaving head in accordance with the invention is characterized in that the distance between the ends of the teeth and the cutting edge lies between 50 and 1000 micrometers. The teeth should not be too short because otherwise the hairs will not be moved along in the tangential direction. Besides, in the case of too long teeth the hairs tend to disengage from between the teeth, after which they are flattened onto the skin by the teeth and are not severed or not severed properly. It has been found that the hairs are severed properly when the dimensions are as mentioned above.

[0018] An embodiment of the shaving head in accordance with the invention is characterized in that at the location of the cutting edge the teeth have a height smaller than 500 micrometers measured in a direction transverse to the supporting surface. It has been found that owing to this measure the hairs are less likely to remain caught between the teeth, which counteracts clogging of the recesses between teeth.

[0019] An embodiment of the shaving head in accordance with the invention is characterized in that the manipulator is movable relative to the frame in a direction transverse to the tangential direction. By means of this measure it is achieved that the friction in the tangential direction between the manipulator and the skin is reduced, as a result of which the skin moves less along the cutting edge and, consequently, the risk of nicking of the skin is reduced. Moreover, this measure

promotes the removal of hair cuttings.

[0020] An embodiment of the shaving head in accordance with the invention is characterized in that the cutting edge is disposed at the level of the supporting surface and the manipulator forms at least a part of the supporting surface. As a result of this, hairs which project only slightly from the skin surface are also moved, so that even the roots of very short hairs are subjected to hardly any load. In addition, the cutter and the manipulator act at the level of the skin surface, as a result of which a smooth shave is obtained.

[0021] An embodiment of the shaving head in accordance with the invention is characterized in that the shaving head is adapted to provide a weak transmission between the manipulator and the skin. A weak transmission between the manipulator and the skin ensures that the manipulator movement is transmitted to the skin to only a small extent, which reduces the risk of the skin being nicked.

[0022] An embodiment of the shaving head in accordance with the invention is characterized in that the manipulator is movable in a direction transverse to the supporting surface. First of all, this reduces the transmission between the manipulator and the skin. Secondly, it ensures that the skin is effectively held at some distance from the cutting edge, which reduces the risk of nicking of the skin. The reduction of this transmission ensures that the manipulator movement transmitted to the skin is weak, as a result of which the skin is less likely to be moved in the tangential direction relative to the cutter and, consequently, the risk of nicking of the skin is reduced.

[0023] An embodiment of the shaving head in accordance with the invention is characterized in that at its side which faces the supporting surface the manipulator comprises a material which provides a low coefficient of friction with respect to the skin surface. For example, a Teflon coating or any other coating which provides a low friction between the manipulator and a skin is suitable for this purpose. Alternatively, the manipulator can be made wholly or partly of a material having a low coefficient of friction with respect to a skin.

[0024] An embodiment of the shaving head in accordance with the invention is characterized in that the cutter and the manipulator are flexible in a direction transverse to the supporting surface. By means of this measure it is achieved that the shaving head is capable of following contours of the skin to some extent, as a result of which less shaving movements are required.

[0025] An embodiment of the shaving head in accordance with the invention is characterized in that the cutting edge has a serrated structure with serrations smaller than 100 micrometers. Such a knurled structure further facilitates the severing of hairs. This measure is particularly suited for use in the shaving head in accordance with the invention because the hairs are moved in the tangential direction with respect to the cutting edge while the skin is hardly moved in the tangential direction

with respect to the cutting edge, as a result of which the risk of skin injury is small.

[0026] The invention also relates to a shaving apparatus having a shaving head in accordance with the invention and a drive system for driving the manipulator. By means of such a shaving apparatus the advantages as described above are obtained.

[0027] An embodiment of the shaving apparatus in accordance with the invention is characterized in that the drive system is adapted to move the manipulator to and fro in the tangential direction. As a result of this step, the hairs are moved to and fro, so that the range of movement of the hair relative to the skin is traversed several times during cutting of the hair and the force required to move the cutting edge through the hair is thus further reduced.

[0028] An embodiment of the shaving apparatus in accordance with the invention is characterized in that the drive system is adapted to drive the manipulator with an amplitude of 50 to 250 micrometers in the tangential direction. If the amplitude is too small it appears that the hairs are not moved adequately. If the amplitude is too large the hairs slip out of the recesses. It has been found that in said range satisfactory shaving results and a high shaving comfort are obtained.

[0029] An embodiment of the shaving apparatus in accordance with the invention is characterized in that the drive system is adapted to drive the manipulator with a frequency higher than or equal to 100 Hz. It has been found that satisfactory results are obtained already at 100 Hz. The viscoelasticity of the human skin is such that the skin appears to be less compliant for frequencies above 30 Hz, so that it can be moved less easily and the risk of nicking of the skin is further reduced at higher frequencies. Moreover, it has been found that at 100 Hz and a normal speed of movement of the shaving head over the skin the manipulator moves a hair to and fro about ten times during cutting. At a frequency higher than 100 Hz the results improve because the cutting performance improves further with the same amplitude of the manipulator. Besides, the shaving head can be moved more rapidly over the skin at a higher frequency, yielding the same result and comfort.

[0030] An embodiment of the shaving apparatus in accordance with the invention is characterized in that the drive system comprises a piezoelectric element. A piezoelectric element is particularly suitable for driving because the manipulator need only be moved with a small amplitude. Owing to this measure less space is required for the drive system and more freedom is obtained for an aesthetically pleasing design of the shaver.

[0031] An embodiment of the shaving apparatus in accordance with the invention is characterized in that the mass of the oscillating parts is more than 10 times as small as the mass of the shaving apparatus. This precludes a movement of the cutter relative to the skin in the tangential direction as a result of reaction forces.

Preferably, the shaving apparatus comprises a counter-mass which is moved oppositely to the manipulator in order to counteract reaction forces on the cutter.

[0032] The invention also relates to a shaving apparatus comprising a shaving head in accordance with the invention and an applicator for applying an agent to the skin, which agent reduces the transmission between the manipulator and the skin. By means of this measure it is achieved that when the shaving head is repeatedly moved over a part of the skin this part of the skin can each time be provided with a film of the agent. Thus, with such a repeated application, the transmission between the skin and the manipulator is kept under control, thereby minimizing the risk of skin injury. Even if the agent is water, this provides a substantial reduction of the transmission between the skin and the manipulator because the water forms a film between the manipulator and the skin. In addition, special emulsions or water containing friction-reducing and or skin-care additives may further improve the shaving comfort.

[0033] An embodiment of the shaving apparatus in accordance with the invention is characterized in that the applicator comprises a porous structure. Owing to this measure the skin can be moistened by briefly holding the applicator, for example while attached to the apparatus, under the tap before and, if desired, during shaving. The applicator absorbs water when held under the tap and it releases the water again when brought into contact with the skin owing to the capillary action of the spaces between the applicator and the skin.

[0034] An embodiment of the shaving apparatus in accordance with the invention is characterized in that the agent comprises a substance which can be taken up by water and which is stored in the porous structure. This substance may include skin-care additives which further improve the shaving comfort.

[0035] An embodiment of the shaving apparatus in accordance with the invention is characterized in that the applicator takes the form of a roller. Owing to this measure the applicator can roll over the skin during shaving so that the applicator does not hook behind stubbles and each time another part of the applicator comes into contact with the skin.

[0036] An embodiment of the shaving apparatus in accordance with the invention is characterized in that said applicator comprises a reservoir for holding said agent and further comprises dispenser means for applying the agent to the skin in a controlled amount. This measure enables an agent in liquid form or in powder form to be applied to the skin during shaving. The dispenser means may comprise, for example, a pump or a controllable valve.

[0037] The invention will now be described in more detail, by way of example, with reference to the drawings, in which

Figure 1 is a diagrammatical side view of a first embodiment of the shaving apparatus in accord-

ance with the invention,

Figure 2 and Figure 3 are sectional views showing a hair and the cooperation of the shaving head in accordance with the invention with the hair,

Figure 4 is a perspective view showing a second embodiment of the shaving apparatus in accordance with the invention,

Figure 5 shows a part of a second embodiment of the shaving head in accordance with the invention,

Figure 6 shows diagrammatically a third embodiment of the shaving apparatus in accordance with the invention,

Figure 7 is a perspective view showing a fourth embodiment of the shaving apparatus in accordance with the invention, and

Figure 8 shows a fifth embodiment of the shaving apparatus in accordance with the invention.

[0038] Figure 1 is a diagrammatic side view showing a first embodiment of the shaving apparatus in accordance with the invention. The shaving apparatus 9 comprises a basic part 8 and a shaving head 1 in accordance with the invention. In use the shaving head 1 is pressed against a skin surface 3 and is moved over the skin surface 3 in a shaving direction y. The shaving head 1 serves for severing a hair 2 rooted in the skin 17. The shaving head 1 comprises a frame 14 carrying a stationary cutter 5. The cutter 5 forms part of a supporting surface 4 for supporting the shaving head 1 on the skin surface 3. the cutter 5 has a cutting edge 6 which, in or near the supporting surface 4, extends in a tangential direction x transverse to the shaving direction y. The shaving head 1 further comprises a manipulator 10 adapted to move hairs which engage the cutting edge 6 relative to the shaving head 1 in a direction parallel to the tangential direction x. The manipulator 10 is movable relative to the cutter 5 in the tangential direction x. The manipulator 10 further has recess 13 (see Fig. 4), in the present case formed between teeth 11, for transmitting the movement of the manipulator 10 to the hair 2. The teeth 11 extend just before the cutting edge 6 in a direction transverse to the tangential direction x. The teeth 11 are so positioned that, as a result of the movement of the shaving head 1 in the shaving direction y, a hair 2 engages a recess 13 between two teeth 11 before it contacts the cutting edge 6 of the cutter 5. The shaving head 1 is adapted to produce an oscillating movement of the manipulator 10 by means of a guide 12. The basic part 8 comprises a drive system 30 for driving the manipulator 10 in the tangential direction x. The drive system 30 is adapted to drive the manipulator 10 in a reciprocating fashion with a frequency of 100 Hz. For this purpose, the drive system 30 comprises an electric motor 31, which drives an eccentric 32. The eccentric 32 engages a groove 15 in the manipulator 10, which groove extends in the shaving direction y. In the tangential direction x the groove 15 accurately fits around the eccentric 32, so that a rotary movement of the eccentric

32 is converted into a reciprocating movement of the manipulator 10 in the tangential direction x. To power the motor 31 the basic part 8 comprises a battery 33 and a switch 34. Instead of the rotary motor 31 it is possible to use a vibramotor, in which case the eccentric 32 can be dispensed with.

[0039] In the embodiment of the shaving head in accordance with the invention shown in Fig. 1 the cutter 5 and the manipulator 10 each form part of the supporting surface 4. As a result of this, a hair 2 can be severed very close to the skin surface 3 and a very short hair can also be moved to and fro in the tangential direction x by the teeth 11 of the manipulator 10.

[0040] The teeth 11 are dimensioned in such a way that the distance d between the ends of the teeth 11 and the cutting edge 6, measured in the shaving direction y, is approximately 250 micrometers. At the location of the cutting edge 6 in the direction z transverse to the supporting surface 4 the teeth 11 have a dimension h of approximately 300 micrometers. Owing to these dimensions hair cuttings readily fall out of the gaps between the teeth 11 and clogging of the gaps between the teeth 11 is avoided. The teeth 11 and the cutter 5 are slightly flexible in the direction z, thereby enabling skin contours to be followed to some extent.

[0041] Figure 2 and Figure 3 both show a sectional view of a hair 2 in a follicle 7 in a skin 17. Figure 2 shows the hair 2 in a position in which one of the teeth 11 has pressed the hair 2 in a direction opposite to the tangential direction x. The hair 2 is then wholly pressed against the left side of the follicle 7 in the skin 17. It is clearly visible that the hair 2 has a clearance s in the follicle 7.

[0042] Figure 3 shows the hair 2 in a position in which the hair 2 is wholly pressed against the right-hand side of the follicle 7 in the skin 17 by one of the teeth 11. It has been found that the clearance s of the hair relative to the follicle 7 is of the order of magnitude of some hundreds of micrometers. As a result, the hair 2 can be moved to and fro by the teeth 11 with a comparatively high speed, while the skin 17 follows the movement of the hair 2 only partly or not at all. The latter depends particularly on the transmission between the teeth 11 and the skin surface 3 for movements in the tangential direction x. This transmission can also be produced via the hair 2. However, it has been found that if the drive system 30 (see Figure 1) is adapted to drive the manipulator 10 with a frequency of 100 Hz and an amplitude between 50 and 250 micrometers in the tangential direction x, this yields a weak transmission.

[0043] Figure 4 is a perspective view showing a second embodiment of the shaving apparatus in accordance with the invention. The shaving apparatus 109 comprises a shaving head 101. The shaving head 101 comprises a manipulator 110 having teeth 111, the distance w between the teeth 111 being approximately 250 micrometers. At their upper sides the teeth 111 have a coating 21 for reducing the friction between the skin surface 3 (see Figure 1) and the manipulator 110. The

shaving apparatus 109 comprises a basic part 108, which accommodates a drive system for driving the manipulator 110. The drive system comprises a piezoelectric element 35 driven by an oscillator 36. The oscillator 36 is energized by means of a battery 33 and a switch 34. At its lower side the piezoelectric element is secured (not shown) in the basic part 108 and at its upper side it has a projection 37 which engages a groove 15 in the manipulator 110 of the shaving head 101. When the oscillator 36 is energized the piezoelectric element 35 performs an oscillating movement in the tangential direction x. This oscillating movement is transmitted to the manipulator 110 via the projection 37 and the groove 15.

[0044] Figure 5 is a perspective view showing a part of a second embodiment of the shaving head in accordance with the invention. The shaving head 201 comprises a frame 214, a manipulator 210 and a spacer, in the present case formed by ridges 23 for reducing the contact area between the manipulator 210 and the skin (not shown). The ridges 23 are situated on the teeth 211 and extend in the tangential direction x. The shaving head 201 further comprises a guide 212 for guiding the manipulator 210 relative to the shaving head 201. The guide 212 is such that the manipulator 210 is movable in the tangential direction x and is also movable in a direction 280 having a component in the shaving direction y and a component in the direction z transverse to the supporting surface 4. The cutter 205 has a cutting edge 206 with a serrated structure whose serrations are shown to a highly enlarged scale and have a dimension t of approximately 40 micrometers.

[0045] Figure 6 shows diagrammatically a third embodiment of the shaving apparatus in accordance with the invention. The shaving apparatus 209 comprises a basic part 8 as shown in Figure 1 and a shaving head 201 in accordance with the second embodiment of the invention as shown in Figure 5. The manipulator 210 has a recess 215 which fits tightly around the eccentric 32. When the eccentric 32 is driven by a motor 31 the manipulator 210 follows the circular movement of the eccentric 32. As a result of this, the manipulator performs both a reciprocating movement in the tangential direction x and a reciprocating movement in the direction 280. The movement in the direction 280 has a component in the direction z, so that the skin is held effectively at some distance from the cutting edge 206. Moreover, this reduces the transmission between the manipulator 210 and the skin. The movement in the direction 280 also has a component in the shaving direction y. This promotes the removal of hair cuttings.

[0046] The mass of the manipulator 210 is approximately 20 times as small as the mass of the shaving apparatus 209. This counteracts a movement of the cutter 205 in the tangential direction x relative to the skin as a result of the reaction forces.

[0047] Figure 7 is a perspective view of a fourth embodiment of the shaving apparatus in accordance

with the invention. The shaving apparatus 309 comprises a shaving head 301 and an applicator for applying an agent to the skin during shaving. The shaving head 301 comprises a cutter 305 and a manipulator having teeth 311. The teeth 311 slightly converge towards their ends to promote the capture of hairs between the teeth 311. The shaving apparatus 309 comprises an applicator formed by a roller-shaped porous element 322 arranged in a recess 320 in the shaving apparatus 309. The roller 322 can be moistened by holding the shaving apparatus 309 in a water jet. Preferably, the roller 322 contains a substance which can be taken up by water and which has a friction-reducing and/or skin-care effect. By pulling the shaving head 301 over the skin in the shaving direction y the skin is moistened, as a result of which the transmission between the teeth 311 and the skin is reduced.

[0048] Figure 8 shows a fifth embodiment of the shaving apparatus in accordance with the invention. The shaving apparatus 409 comprises a shaving head 301 as shown in Figure 7. In addition, the shaving apparatus 409 comprises a reservoir 40 containing a liquid agent for reducing the transmission between the manipulator and the skin. The shaving apparatus 409 further comprises dispenser means, in the present case a pump 41 comprising a push-button 44, an inlet tube 45 and a dispenser channel 42. By regularly pressing the push-button 44 during shaving the agent is pumped from the reservoir 40 to outlet apertures 43 near the shaving head 301 via the dispenser channel 42. Thus, the skin is moistened with the agent and the transmission between the teeth 311 and the skin is reduced.

[0049] It is to be noted that the invention is not limited to the embodiments described hereinbefore. For example, instead of recesses the manipulator can have a surface with a high friction relative to the hairs. Alternatively, the manipulator can move the hairs by imparting vibrations to the skin or the air just above the skin. If desired, the hairs can be moved in the tangential direction by an electrostatic method. Moreover, it is conceivable to drive the manipulator by means of a roller which is applied to the skin and which is drivable by pulling the shaving apparatus over the skin. Furthermore, the shaving head can be adapted for use with an exchangeable cutter, so that a cutter can readily be replaced by a new cutter. Besides, the shaving head may comprise an adjustment mechanism to adjust the distance between the shaving head and a supporting surface.

Claims

1. A shaving head (1; 101; 201; 301) comprising a cutter (5; 105; 205; 305) having a cutting edge (6; 206) for cutting hairs (2) near the skin (17) and a manipulator (10; 110; 210) adapted to move a hair along the cutting edge, characterized in that the manipulator is adapted to move the hair (2) relative to the

skin while the hair is being cut by the cutting edge (6; 206).

2. A shaving head (1; 101; 201; 301) as claimed in Claim 1, characterized in that the manipulator (10; 110; 210) is adapted to move hairs (2) to and from along the cutting edge (6; 206).

3. A shaving head (1; 101; 201; 301) as claimed in any one of the preceding Claims, characterized in that the shaving head comprises a supporting surface (4) for supporting the shaving head on the skin (17), the shaving head comprises a frame (14; 214), and the manipulator (10; 210) is movable relative to the frame in a tangential direction (x) along the cutting edge (6; 206).

4. A shaving head (1; 101; 201; 301) as claimed in Claim 3, characterized in that the manipulator has recesses (13) which extend near the cutting edge (6; 206).

5. A shaving head (1; 101; 201; 301) as claimed in Claim 4, characterized in that in the tangential direction (x) the recesses (13) have a width (w) between 100 and 400 micrometers.

6. A shaving head (1; 101; 201; 301) as claimed in Claim 4 or 5, characterized in that the recesses (13) are formed between teeth (111; 211).

7. A shaving head (1; 101; 201; 301) as claimed in Claim 6, characterized in that the distance (d) between the ends of the teeth (11) and the cutting edge (6) lies between 50 and 1000 micrometers.

8. A shaving head (1; 101; 201; 301) as claimed in Claim 6 or 7, characterized in that at the location of the cutting edge (6; 206) the teeth (11) have a height (h) smaller than 500 micrometers measured in a direction (z) transverse to the supporting surface (4).

9. A shaving head (201) as claimed in any one of the preceding Claims 3 to 8, characterized in that the manipulator (210) is movable relative to the frame (214) in a direction (280) transverse to the tangential direction (x).

10. A shaving head (1; 101; 201; 301) as claimed in any one of the preceding Claims 3 to 9, characterized in that the cutting edge (6; 206) is disposed at the level of the supporting surface (4) and the manipulator (10; 110; 210) forms at least a part of the supporting surface.

11. A shaving head (1; 101; 201; 301) as claimed in any one of the preceding Claims 3 to 10, characterized

in that the shaving head is adapted to provide a weak transmission between the manipulator (10; 110; 210) and the skin (17).

12. A shaving head (201) as claimed in Claim 11, characterized in that the manipulator (210) is movable in a direction (z) transverse to the supporting surface (4).

13. A shaving head (101) as claimed in Claim 11 or 12, characterized in that at its side which faces the supporting surface (4) the manipulator (110) comprises a material (21) which provides a low coefficient of friction with respect to the skin surface (3).

14. A shaving head (1) as claimed in any one of the preceding Claims 3 to 13, characterized in that the cutter (5) and the manipulator (10) are flexible in a direction transverse to the supporting surface (4).

15. A shaving head (201) as claimed in any one of the preceding Claims, characterized in that the cutting edge (6) has a serrated structure (206) with serrations smaller than 100 micrometers.

16. A shaving apparatus (9; 109; 209; 309) comprising at least one shaving head (1; 101; 201; 301) as claimed in any one of the preceding Claims and a drive system (30; 35) for driving the manipulator (10).

17. A shaving apparatus (9; 109; 209; 309) as claimed in Claim 16, characterized in that the drive system (30; 35) is adapted to move the manipulator (10) to and fro in the tangential direction (x).

18. A shaving apparatus (9; 109; 209; 309) as claimed in Claim 17, characterized in that the drive system (30; 35) is adapted to drive the manipulator (10; 110; 210) with an amplitude of 50 to 250 micrometers in the tangential direction (x).

19. A shaving apparatus (9) as claimed in Claim 17 or 18, characterized in that the drive system (30) is adapted to drive the manipulator (10) with a frequency higher than or equal to 100 Hz.

20. A shaving apparatus (109) as claimed in Claim 17, 18 or 19, characterized in that the drive system comprises a piezoelectric element (35).

21. A shaving apparatus (9; 109; 209; 309) as claimed in Claim 17, 18, 19 or 20, characterized in that the mass of the oscillating parts (10; 110; 210) is more than 10 times as small as the mass of the shaving apparatus.

22. A shaving apparatus (309; 409) as claimed in any

one of the preceding Claims 16 to 21, comprising an applicator (322; 40-44) for applying an agent to the skin, which agent reduces the transmission between the manipulator and the skin.

23. A shaving apparatus (309) as claimed in Claim 22, characterized in that the applicator comprises a porous structure (322).

24. A shaving apparatus (309) as claimed in Claim 23, characterized in that the agent comprises a substance which can be taken up by water and which is stored in the porous structure (322).

25. A shaving apparatus (309) as claimed in Claim 23 or 24, characterized in that the applicator (322) takes the form of a roller.

26. A shaving apparatus (409) as claimed in Claim 22, characterized in that said applicator comprises a reservoir (40) for holding said agent and further comprises dispenser means (41, 42) for applying the agent to the skin in a controlled amount.

Patentansprüche

1. Scherkopf (1; 101; 201; 301) mit einem Schneidelement (5; 105; 205; 305) mit einer Schneidkante (6; 206) zum Schneiden von Haaren (2) nahe an der Haut (17) und mit einem Manipulator (10; 110; 210) zum Bewegen des Haares längs der Schneidkante, dadurch gekennzeichnet, daß der Manipulator beim Schneiden des Haares durch die Schneidkante (6; 206) das Haar (2) gegenüber der Haut bewegt.

2. Scherkopf (1; 101; 201; 301) nach Anspruch 1, dadurch gekennzeichnet, daß der Manipulator (10; 110; 210) zum Hin- und Herbewegen von Haaren (2) längs der Schneidkante (6; 206) vorgesehen ist.

3. Scherkopf (1; 101; 201; 301) nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Scherkopf mit einer Stützfläche (4) versehen ist zum Abstützen des Scherkopfes auf die Haut (17), daß der Scherkopf ein Gestell (14; 214) umfaßt, und daß der Manipulator (10; 210) gegenüber dem Gestell beweglich ist in einer tangentiellen Richtung (x) längs der Schneidkante (6; 206).

4. Scherkopf (1; 101; 201; 301) nach Anspruch 3, dadurch gekennzeichnet, daß der Manipulator Ausnehmungen (13) hat, die sich nahe bei der Schneidkante (6; 206) erstrecken.

5. Scherkopf (1; 101; 201; 301) nach Anspruch 4, dadurch gekennzeichnet, daß in der tangentiellen Richtung (x) die Ausnehmungen (13) eine Breite

(w) zwischen 100 und 400 µm haben.

6. Scherkopf (1; 101; 201; 301) nach Anspruch 4 oder 5, dadurch gekennzeichnet, daß die Ausnehmungen (13) zwischen Zacken (111; 211) gebildet sind.

7. Scherkopf (1; 101; 201; 301) nach Anspruch 6, dadurch gekennzeichnet, daß der Abstand (d) zwischen den Enden der Zacken (11) und der Schneidkante (6) zwischen 50 und 1000 µm liegt.

8. Scherkopf (1; 101; 201; 301) nach Anspruch 6 oder 7, dadurch gekennzeichnet, daß an der Stelle der Schneidkante (6; 206) die Zacken (11) eine Höhe (h) kleiner als 500 µm haben, gemessen in einer Richtung (z) quer zu der Stützfläche (4).

9. Scherkopf (201) nach einem der vorstehenden Ansprüche 3 bis 8, dadurch gekennzeichnet, daß der Manipulator (210) gegenüber dem Gestell (214) in einer Richtung (280) quer zu der tangentiellen Richtung (x) beweglich ist.

10. Scherkopf (1; 101; 201; 301) nach einem der vorstehenden Ansprüche 3 bis 9, dadurch gekennzeichnet, daß die Schneidkante (6; 206) auf dem Pegel der Stützfläche (4) vorgesehen ist und der Manipulator (10; 110; 210) wenigstens einen Teil der Stützfläche bildet.

11. Scherkopf (1; 101; 201; 301) nach einem der vorstehenden Ansprüche 3 bis 10, dadurch gekennzeichnet, daß der Scherkopf eine weiche Kupplung zwischen dem Manipulator (10; 110; 210) und der Haut (17) schafft.

12. Scherkopf (201) nach Anspruch 11, dadurch gekennzeichnet, daß der Manipulator (210) in einer Richtung (z) quer zu der Stützfläche (4) beweglich ist.

13. Scherkopf (101) nach Anspruch 11 oder 12, dadurch gekennzeichnet, daß auf der Seite, die der Stützfläche (4) zugewandt ist, der Manipulator (110) ein Material (21) aufweist, das einen niedrigen Reibungskoeffizienten zu der Hautoberfläche (3) schafft.

14. Scherkopf (1) nach einem der vorstehenden Ansprüche 3 bis 13, dadurch gekennzeichnet, daß das Schneidelement (5) und der Manipulator (10) in einer Richtung quer zu der Trägerfläche (4) biegsam ist.

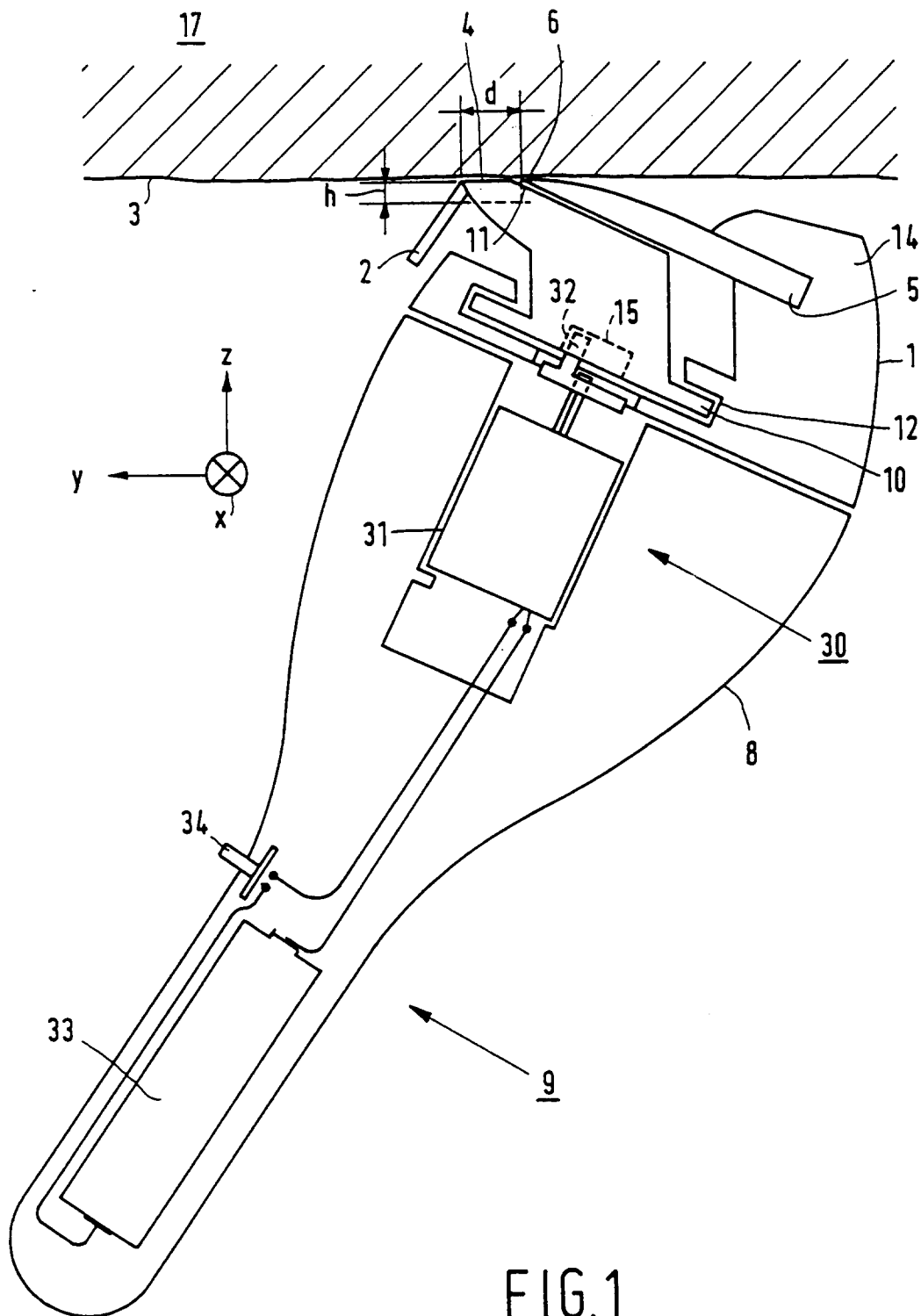
15. Scherkopf (201) nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Schneidkante (6) eine Zickzackstruktur (206) hat, wobei die Vorsprünge kleiner sind als 100 µm.

16. Rasiergerät (9; 109; 209; 309) mit wenigstens einem Scherkopf (1; 101; 201; 301) nach einem der vorstehenden Ansprüche und mit einem Getriebe (30; 35) zum Antreiben des Manipulators (10).
17. Rasiergerät (9; 109; 209; 309) nach Anspruch 16, dadurch gekennzeichnet, daß das Getriebe (30; 35) den Manipulator (10) in tangentieller Richtung (x) hin- und herbewegt.
18. Rasiergerät (9; 109; 209; 309) nach Anspruch 17, dadurch gekennzeichnet, daß das Getriebe (30; 35) den Manipulator (10; 110; 210) mit einer Amplitude von 50 bis 250 µm in der tangentiellen Richtung (x) antreibt.
19. Rasiergerät (9) nach Anspruch 17, dadurch gekennzeichnet, daß das Getriebe (30) den Manipulator (10) mit einer Frequenz von 100 Hz oder höher antreibt.
20. Rasiergerät (109) nach Anspruch 17, 18 oder 19, dadurch gekennzeichnet, daß das Getriebe ein piezoelektrisches Element (35) aufweist.
21. Rasiergerät (9; 109; 209; 309) nach Anspruch 17, 18, 19 oder 20, dadurch gekennzeichnet, daß die Masse der Schwingteile (10; 110; 210) mehr als zehnmal kleiner ist als die Masse des Rasiergeräts.
22. Rasiergerät (309; 409) nach einem der vorstehenden Ansprüche 16 bis 21 mit einem Auftragelement (322; 40-44) zum Auftragen eines Mittels auf der Haut, wobei dieses Mittel die Kupplung zwischen Manipulator und Haut reduziert.
23. Rasiergerät (309) nach Anspruch 22, dadurch gekennzeichnet, daß das Auftragelement eine poröse Struktur (322) hat.
24. Rasiergerät (309) nach Anspruch 23, dadurch gekennzeichnet, daß das Mittel eine Substanz aufweist, die wasserlöslich ist und in der porösen Struktur (322) gespeichert wird.
25. Rasiergerät (309) nach Anspruch 23 oder 24, dadurch gekennzeichnet, daß das Auftragelement (322) die Form einer Rolle hat.
26. Rasiergerät (409) nach Anspruch 22, dadurch gekennzeichnet, daß das genannte Auftragelement einen Behälter (40) aufweist zum Unterbringen des genannten Mittels und weiterhin Verteilungsmittel (41, 42) aufweist zum in kontrollierten Mengen Zuführen des Mittels zu der Haut.

Revendications

1. Tête de rasage (1; 101; 201; 301) comportant un organe de coupe (5; 105; 205; 305) présentant un tranchant (6; 206) pour couper des cheveux (2) près de la peau (17) et un manipulateur (10; 110; 210) adapté à déplacer un cheveu le long du tranchant, caractérisée en ce que le manipulateur est adapté à déplacer le cheveu (2) par rapport à la peau alors que le cheveu est coupé par le tranchant (6; 206).
2. Tête de rasage (1; 101; 201; 301) selon la revendication 1, caractérisée en ce que le manipulateur (10; 110; 210) est adapté à déplacer des cheveux (2) en long et en large du tranchant (6; 206).
3. Tête de rasage (1; 101; 201; 301) selon lune quelconque des revendications précédentes, caractérisée en ce que la tête de rasage comporte une surface d'appui (4) pour appuyer la tête de rasage sur la peau (17), en ce que la tête de rasage comporte un bâti (14. 214) et en ce que le manipulateur (10; 210) est mobile par rapport au bâti dans une direction tangentielle (x) le long du tranchant (6; 206).
4. Tête de rasage (1; 101; 201; 301) selon la revendication 3, caractérisée en ce que le manipulateur présente des évidements (13) qui s'étendent près du tranchant (6; 206).
5. Tête de rasage (1; 101; 201; 301) selon la revendication 4, caractérisée en ce que dans la direction tangentielle (x) les évidements (13) présentent une largeur (w) comprise entre 100 et 400 micromètres.
6. Tête de rasage (1; 101; 201; 301) selon la revendication 4 ou 5, caractérisée en ce que les évidements (13) sont formés entre des dents (111; 211).
7. Tête de rasage (1; 101; 201; 301) selon la revendication 6, caractérisée en ce que la distance (d) entre les extrémités des dents (11) et le tranchant (6) se situe entre 50 et 1000 micromètres.
8. Tête de rasage (1; 101; 201; 301) selon la revendication 6 ou 7, caractérisée en ce qu'à l'endroit du tranchant (6; 206) les dents (11) mesurées dans une direction (z) transversale à la surface d'appui (4) présentent une hauteur (h) inférieure à 500 micromètres.
9. Tête de rasage (201) selon l'une quelconque des revendications précédentes 3 à 8, caractérisée en ce que le manipulateur (210) est mobile par rapport au bâti (214) dans une direction (280) transversale à la direction tangentielle (x).

10. Tête de rasage (1; 101; 201; 301) selon l'une quelconque des revendications précédentes 3 à 9, caractérisée en ce que le tranchant (6; 206) se situe au niveau de la surface d'appui (4) et en ce que le manipulateur (10; 110; 210) constitue au moins une partie de la surface d'appui. 5
11. Tête de rasage (1; 101; 201; 301) selon l'une quelconque des revendications précédentes 3 à 10, caractérisée en ce que la tête de rasage est adaptée à fournir une faible transmission entre le manipulateur (10; 110; 210) et la peau (17). 10
12. Tête de rasage (201) selon la revendication 11, caractérisée en ce que le manipulateur (210) est mobile dans une direction (z) transversale à la surface d'appui (4). 15
13. Tête de rasage (101) selon la revendication 11 ou 12, caractérisée en ce qu'à son côté faisant face à la surface d'appui (4) le manipulateur (110) comporte un matériau (21) qui fournit un faible coefficient de frottement par rapport à la surface (3) de la peau. 20
14. Tête de rasage (1) selon l'une quelconque des revendications précédentes 3 à 13, caractérisée en ce que l'organe de coupe (5) et le manipulateur (10) sont flexibles dans une direction transversale à la surface d'appui (4). 25
15. Tête de rasage (201) selon l'une quelconque des revendications précédentes, caractérisée en ce que le tranchant (6) est pourvu d'une structure dentelée (206) présentant des dentelures dont la taille est inférieure à 100 micromètres. 30
16. Rasoir (9; 109; 209; 309) comportant au moins une tête de rasage (1; 101; 201; 301) selon l'une quelconque des revendications précédentes et un système d'entraînement (30; 35) pour entraîner le manipulateur (10). 40
17. Rasoir (9; 109; 209; 309) selon la revendication 16, caractérisé en ce que le système d'entraînement (30; 35) est adapté à animer le manipulateur (10) d'un mouvement de va-et-vient dans la direction tangentielle (x). 45
18. Rasoir (9; 109; 209; 309) selon la revendication 17, caractérisé en ce que le système d'entraînement (30; 35) est adapté à entraîner le manipulateur (10; 110; 210) avec une amplitude comprise entre 50 et 250 micromètres dans la direction tangentielle (x). 50
19. Rasoir (9) selon la revendication 17 ou 18, caractérisé en ce que le système d'entraînement (30) est adapté à entraîner le manipulateur (10) avec une fréquence supérieure ou égale à 100 Hz. 55
20. Rasoir (109) selon la revendication 17, 18 ou 19, caractérisé en ce que le système d'entraînement comporte un élément piézoélectrique (35).
21. Rasoir (9; 109; 209; 309) selon la revendication 17, 18, 19 ou 20, caractérisé en ce que la masse des parties oscillantes (10; 110; 210) est plus de 10 fois intérieure à la masse du rasoir.
22. Rasoir (309; 409) selon l'une quelconque des revendications précédentes 16 à 21, comportant un applicateur (322; 40-44) pour appliquer un agent sur la peau, ledit agent réduisant la transmission entre le manipulateur et la peau.
23. Rasoir (309) selon la revendication 22 caractérisé en ce que l'applicateur présente une structure poreuse (322).
24. Rasoir (309) selon la revendication 23, caractérisé en ce que l'agent comporte une substance qui peut être absorbée par de l'eau et qui est stockée dans la structure poreuse (322).
25. Rasoir (309) selon la revendication 23 ou 24, caractérisé en ce que l'applicateur (322) adopte la forme d'un rouleau.
26. Rasoir (409) selon la revendication 22, caractérisé en ce que ledit applicateur comporte un réservoir (40) pour loger ledit agent et en ce qu'il comporte encore des moyens de dosage (41, 42) pour appliquer l'agent sur la peau dans une quantité dosée.



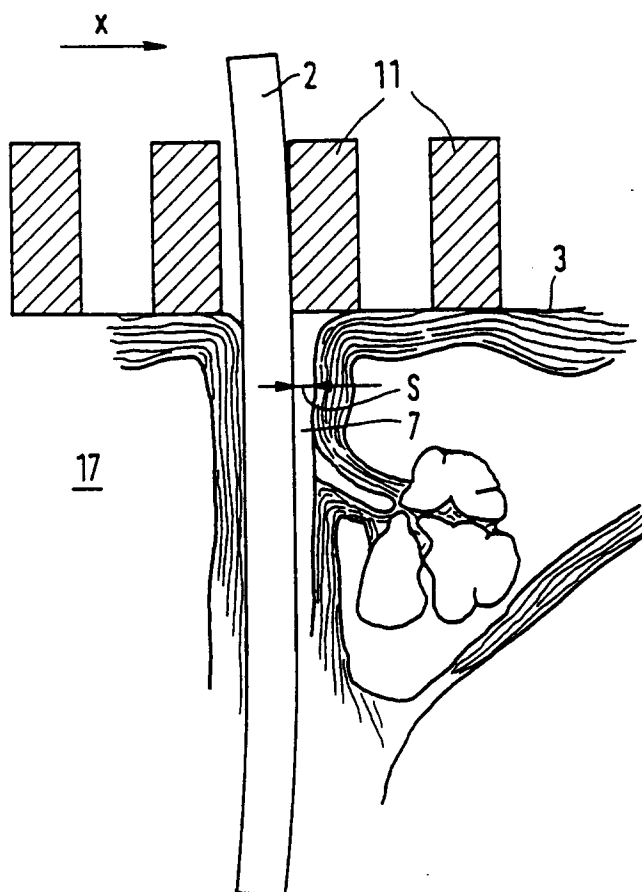


FIG. 2

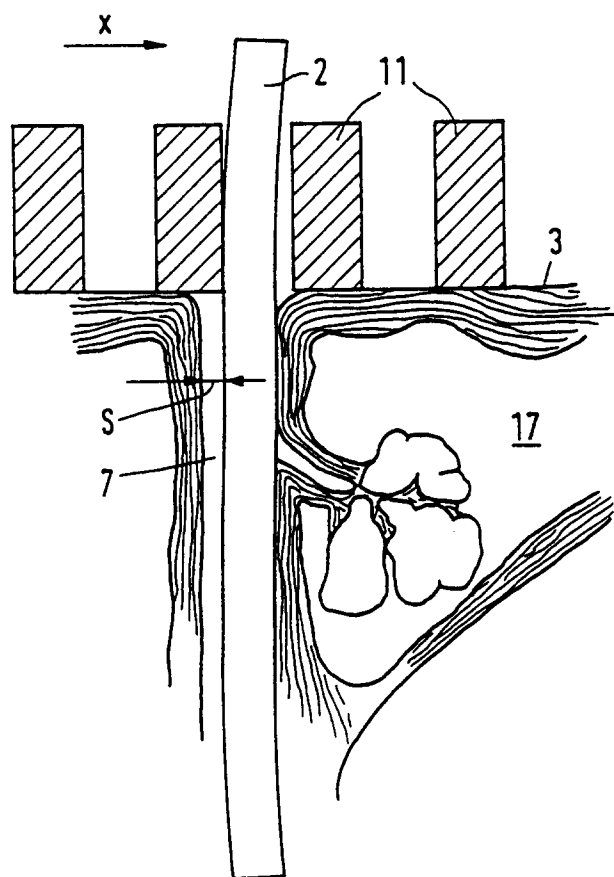


FIG. 3

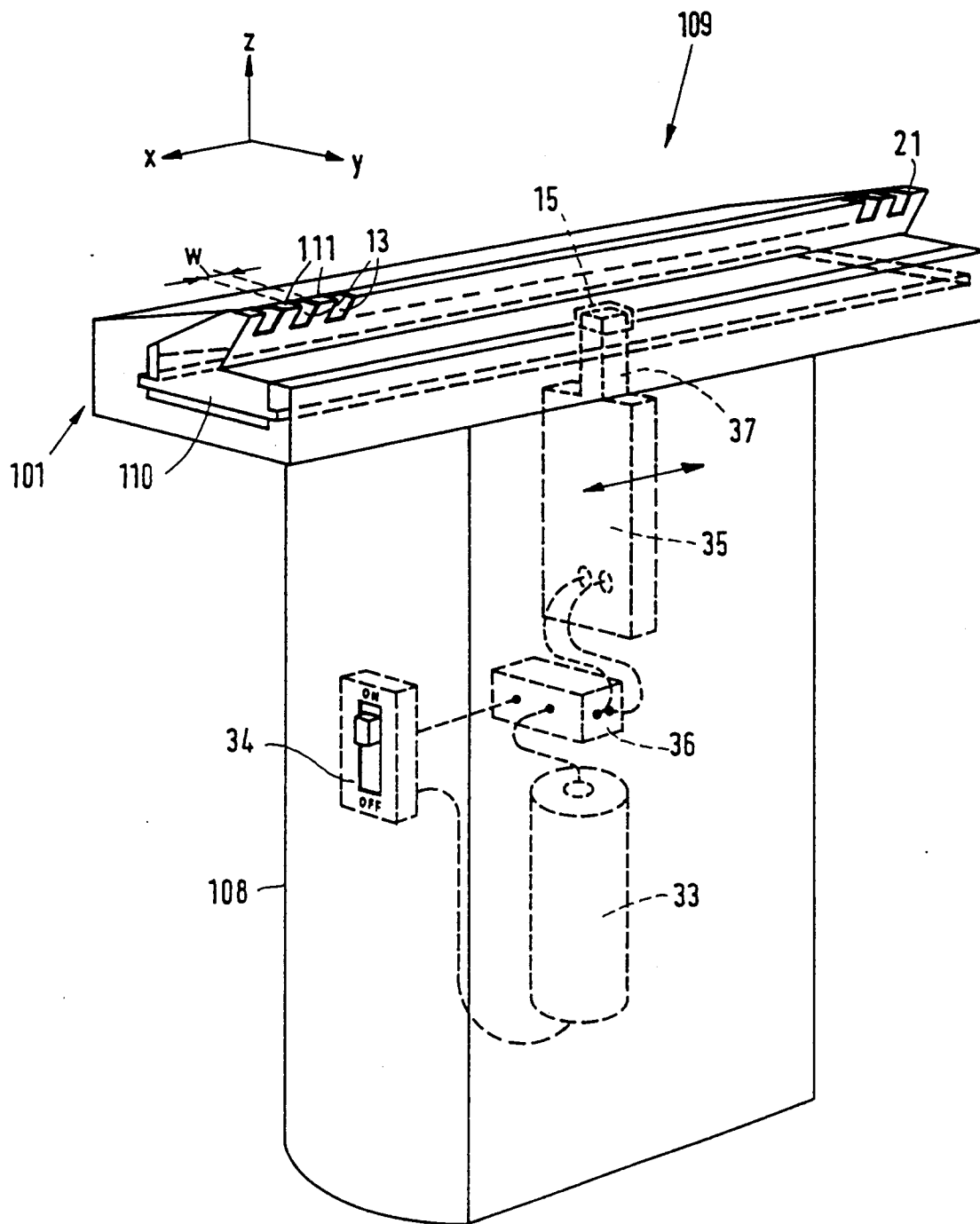


FIG. 4

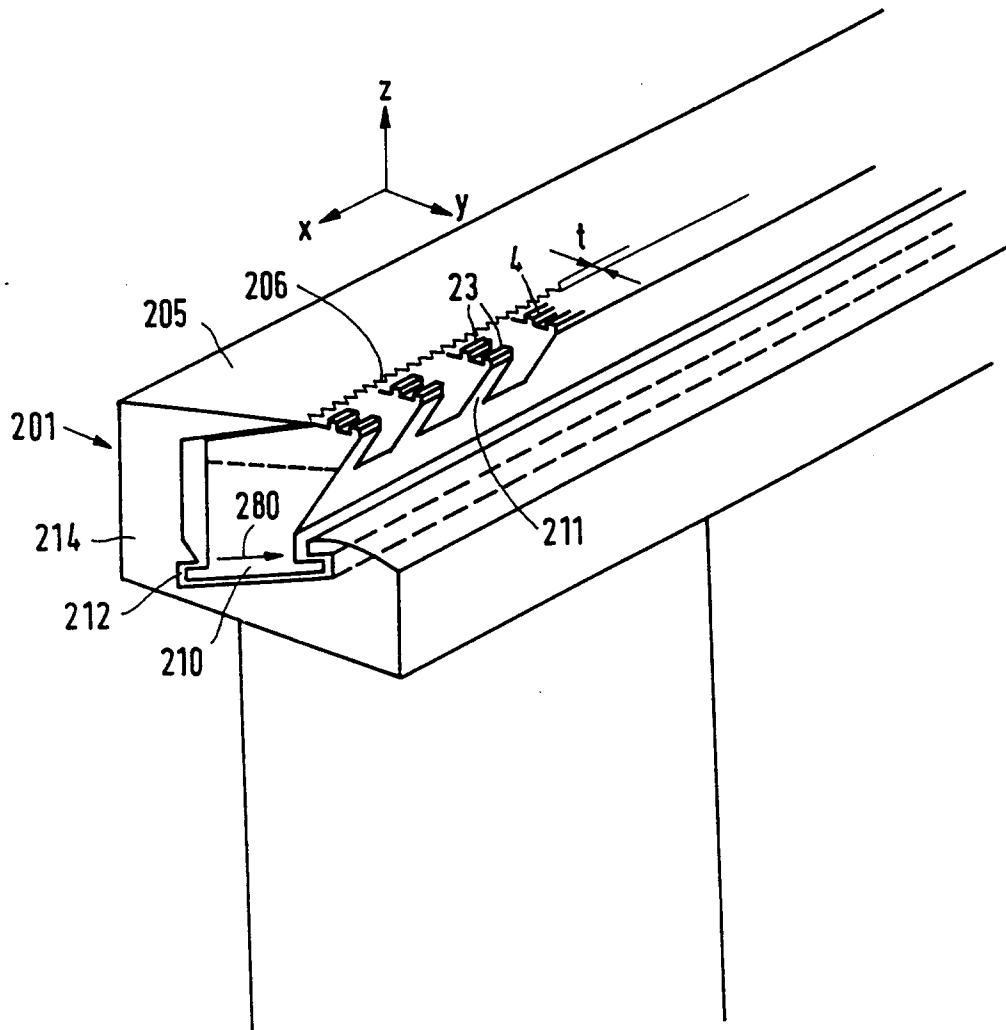


FIG. 5

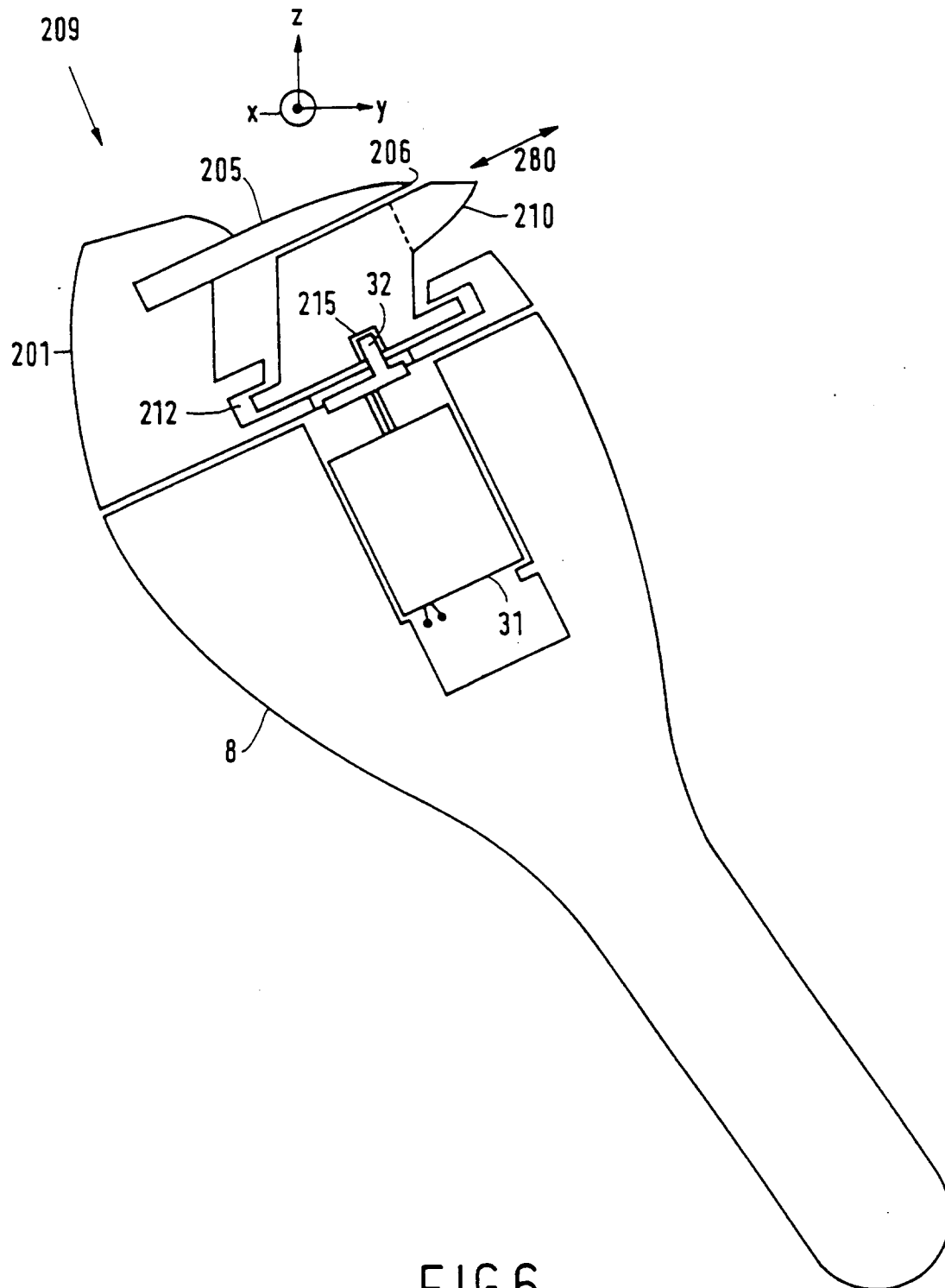


FIG.6

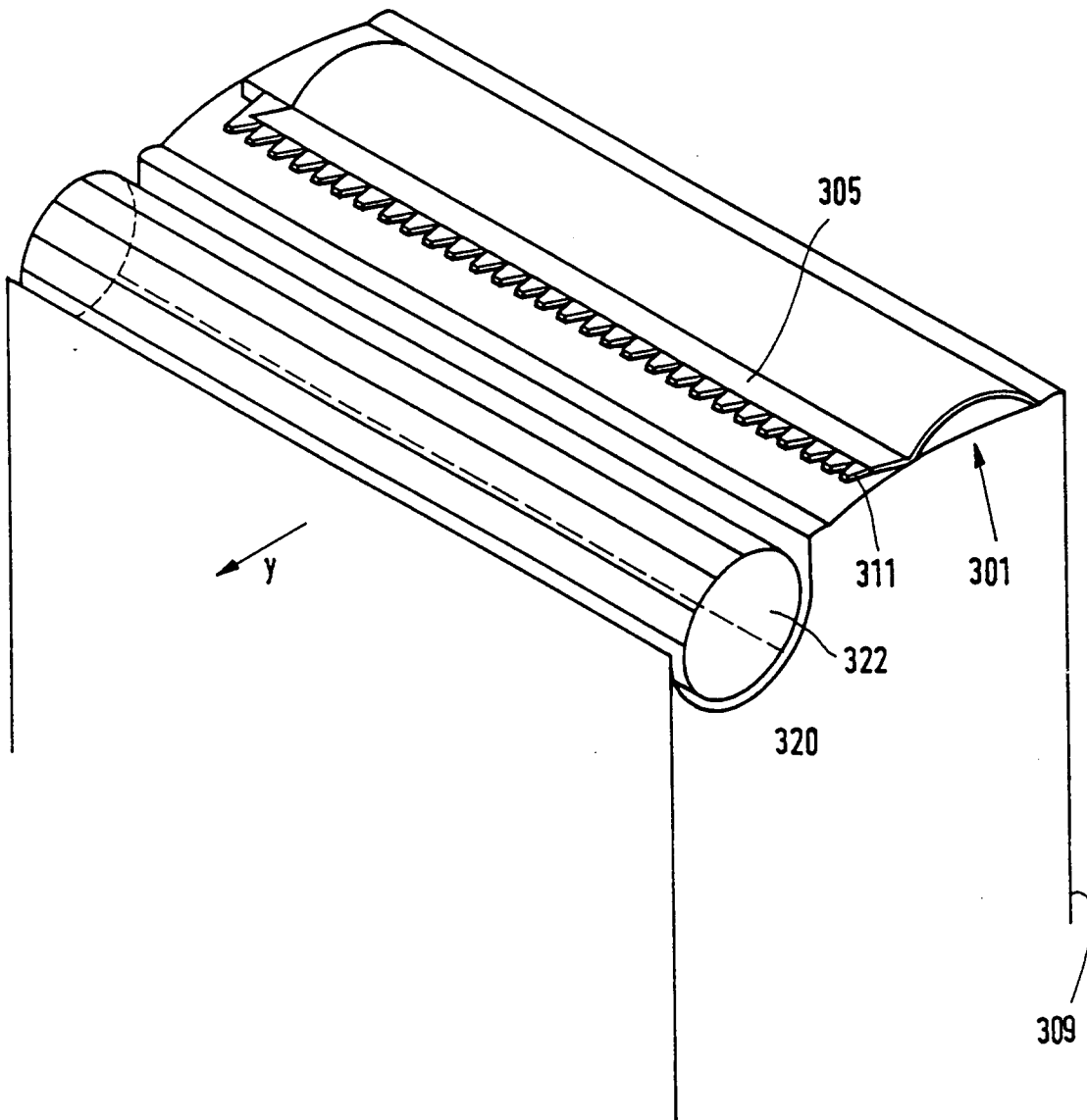


FIG. 7

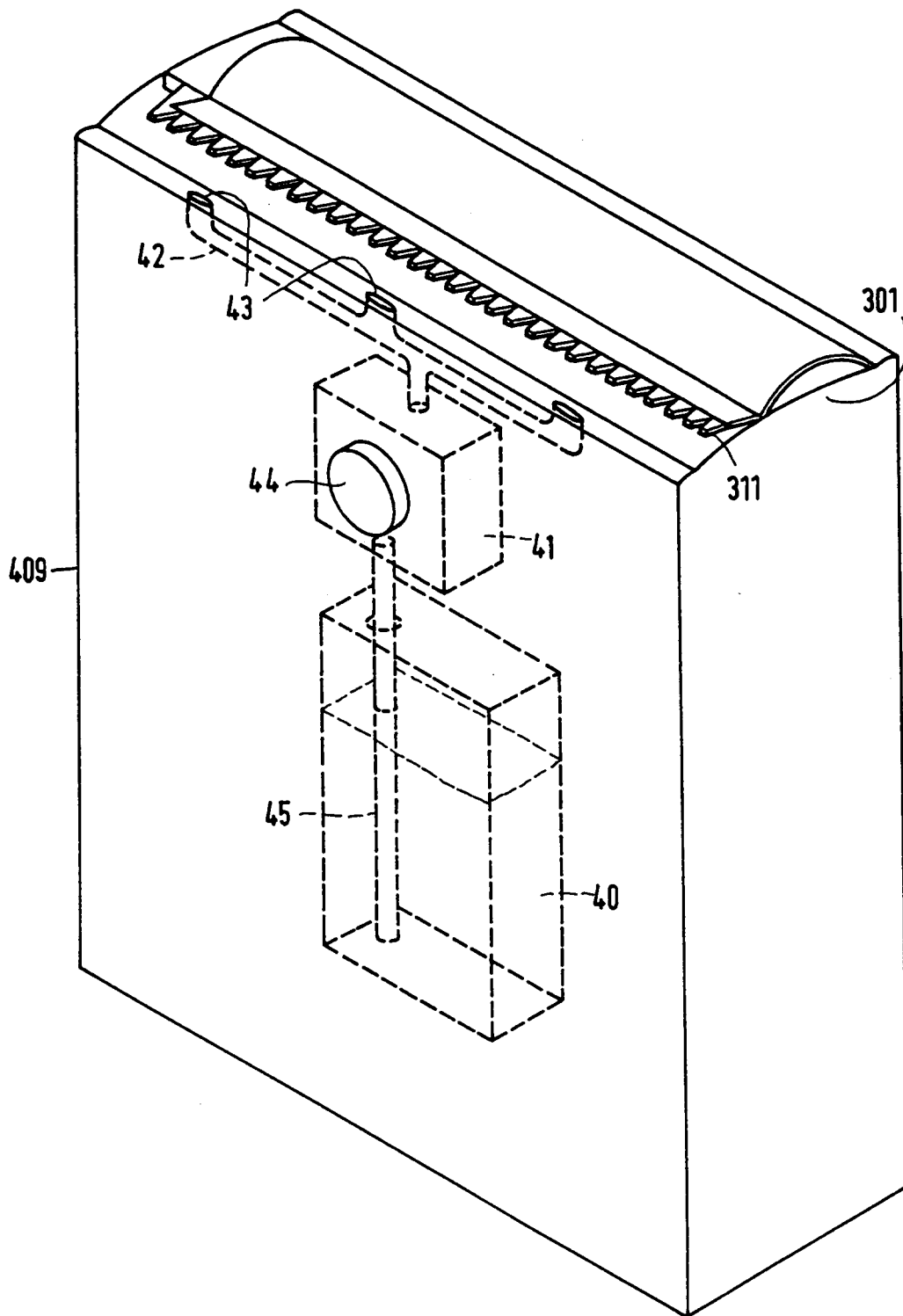


FIG. 8