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SHAVING HEAD FOR DRY SHAVERS HAVING A COATED CUTTING EDGE SURFACE

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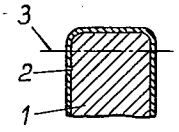


Fig.1

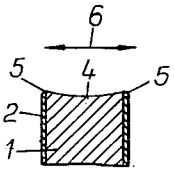


Fig.2

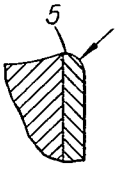


Fig.2a

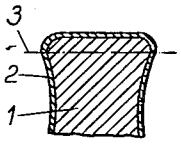


Fig.3

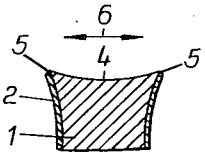


Fig.4

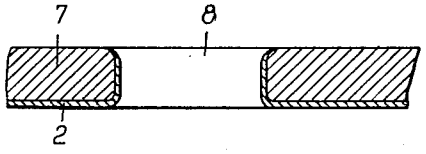


Fig.5

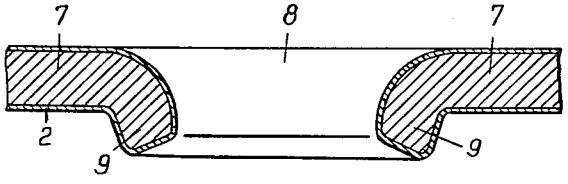
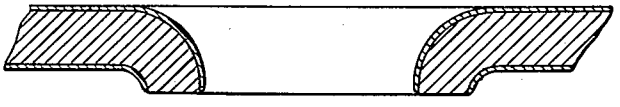


Fig.6

Fig.7



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SHAVING HEAD FOR DRY SHAVERS HAVING A COATED CUTTING EDGE SURFACE

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The invention relates to cutting heads for dry shavers, comprising an outer cutting part, which slides or rolls on the skin, and may have the form of a perforated sheet or of a comb, and an inner cutting part, one of these parts being moved relative to the other, and preferably operated electrically. Said inner cutting part may again consist of a perforated plate, or it may comprise a set of blades, the individual cutting blades of which are fitted rigidly or individually moving into a block. This driven part may rotate or oscillate relative to the outer part.

These two parts of the cutting system, usually referred to as the cutting head, are usually made of steel. There are also know perforated plates made by galvanic methods. For purposes of protection from corrosion, and in order to protect the skin of the face from infection, steel is usually provided with a coating of rare or non-ferrous metals.

The quality of the cut, and therefore also the shaving effect of a dry shaver of this kind depends largely on the design of the cutting edges of the cutting blade or blades and/or on the edges of the holes in the perforated sheet. The smaller the cutting edge radius, the softer and smoother will be the cut, with a certain given contact of the relatively moving parts of the cutting system, because otherwise the hair of the beard is squeezed and caught thereinbetween. It is, therefore, usual to grind at least the cutting blades of the inner part. However, on the other hand, a smaller cutting edge radius will, owing to the required contact pressure, be liable to accelerated wear and the useful life of the cutting part is shorter, so that the originally good cutting effect of the appliance quickly deteriorates. Contact pressure and friction determine essentially the input requirements of the appliance, which is of decisive importance, primarily with battery-operated shavers. These, mutually incompatible requirements, relating to the quality of the cut and the useful life, can be solved only by a compromise, whereby the superiority of dry shavers over wet shaving appliances may be expessed only to a limited degree.

According to the present invention, it is possible to achieve considerably improved cutting properties and performances, and a longer useful life, if at least one part of the cutting system is provided with a coating of titanium carbide, titanium boride, or titanium nitride. For this purpose, the invention uses a process, which has become known in very recent times, by means of which process these coating are precipitated on to the base metal by precipitation from the gaseous phase at temperatures of about 1000° C. These coatings are firmly anchored in the base metal and are characterized by their extraordinary hardness. In the case of embossing and drawing tools it was possible thereby to increase the useful service life to about five to six times the original values. It was found that these coatings, which may be produced in layers of 1/1000 mm., may also be applied to the thin parts of the cutting system of dry shavers, such as perforated sheets and blades, without incurring the risk that the high temperatures used might cause structural changes or distortion of the base metals.

If such a distortion should occur, it may be countered

by the suitable arrangement and mounting of the parts during the treatment. Steel sheets may, at the end of the treatment, on leaving the processing chamber, be immediately hardened by quenching, or be subjected to annealing. The appearance of the coating is governed by that of the base metal, that is by its structure and surface, and may be dull or bright.

Tests showed not only a better useful service life and resistance to corrosion, but, surprisingly, also a considerably better cutting effect after the grinding, which decreased only little during endurance tests. The cutting edge radius of a perforated metal sheet or blade without coating is determined by the type of grinding means and the grinding process, and cannot pass below several thousandths of a millimetre. However, if the coating at the cutting edge is ground, the cutting edge radius is reduced to the thickness of the coating which, as mentioned hereinbefore, may be adjusted to as little as 1/1000 mm., and, owing to the extraordinary hardness and good adhesion of the coating on the base metal, and owing to the low coefficient of friction of these coating in comparison with the base metal, this radius remains practically constant.

It is, in this connection, of advantage if, according to a further development of the invention, the grinding process and the grinding means are so adjusted that the base metal is eliminated to a higher degree than the coating, because this will produce a slightly hollow ground edge, which increases the quality of the cut yet further.

In order to make use of the low coefficient of friction of the coatings it may be expedient to grind only one cutting part, preferably the knife, owing to its greater thickness.

The invention will be further described, by way of example, with reference to the accompanying drawing, in which:

FIGS. 1 to 4 show two designs of cutting blades in cross-section on a very enlarged scale, after the application of the coating (FIGS. 1 and 3), and after the grinding (FIGS. 2, 2*a* and 4);

FIG. 5 shows a smooth cutter plate, and

FIGS. 6 and 7 show a cutter plate with raised edges of the perforations before and after the grinding.

In FIGS. 1 to 4, the cutting part blade body **1**, made of hardenable steel, has a coating or coating means **2** of titanium carbide, boride or nitride. The blade is usually of semicircular or crescent shape. After the application of the coating, and in a process following thereupon, the cutting edge is ground down to the dash-dotted line **3**, which is so low that the rounding of the edges, caused by the stamping of the blade, is ground off. The grinding is necessary in order to produce the required shape of the blade, and, in the case of blade parcels, in order to ensure a uniform blade height.

After the grinding, the cutting edge **4** is ground slightly hollow, and its cutting edges or margins **5** of the cutting have a radius which is approximately equal to the thickness of the coating **2**, as shown on a more enlarged scale in FIG. 2 in the top right-hand corner. The arrow **6** indicates the direction of movement of the blade in the cutting head with oscillating motion. The coating margins **5** are flush with the inner face of the outer cutting part when the shaver head is assembled.

FIGS. 3 and 4 show another design, comprising a previously proposed reinforced head. Also here, the coating with a very hard coating has beneficial effects on the quality of the cut, because the larger cutting edge radius possible in the base metal makes good, in part the conicity of the cutting edges (FIG. 3).

FIG. 5 shows, on an enlarged scale, a perforated sheet **7**, having a one-sided coating; the sheet is made of steel

or nickel, and is provided with many holes or perforations **8** allowing the hair of the beard to pass. The blade or blades move underneath the sheet or screen past the holes (FIGS. 2 or 4 in conjunction with FIG. 5). The substantial improvement of the hole edge radius or convex marginal portions of the coating, which governs the quality of the cut, and caused by the coating reaching to within the holes, is shown. The flexibility of the sheet is such that it may adapt itself to the shape of the knife head. It need not be ground.

FIGS. 6 and 7 show a perforated sheet with drawn hole edges **9**. The service life of the hole edges, which are raised on the cutting side, and are very thin, is increased considerably by the coating of the invention. In order to produce a smooth shave, the coating may, on the contact side of the sheet, be ground down to the base metal (FIG. 7). However, the perforated sheet may also be ground on its cutting side (underside) before the coating is applied. The coating may be polished with diamond paste.

This invention is not restricted to the exemplified embodiments shown and may be applied equally well to other designs of screens and blades, in particular also to cutting combs.

What we claim is:

1. A shaving head for a dry shaver comprising an outer stationary cutter member having portions defining a plurality of perforations therein, an inner movable cutting member adapted to cooperatively engage said outer stationary cutter member, a coating on said inner movable cutting member over a major portion of its surface, the cutting areas of said inner cutter member being devoid of said coating and having a concavity therein, portions of said coating being adjacent said cutting area and having rounded edges, the radius of said rounded edges being approximately equal to the thickness of said coating.

2. A shaving head for a dry shaver as defined in claim 1, wherein said outer stationary cutter member includes a coating thereon over a major portion of its surface, the area of said cutter member adjacent the perforations therein defining cutting areas, and said cutting areas being devoid of said coating.

References Cited in the file of this patent

UNITED STATES PATENTS

2,065,654	Claisse	Dec. 29, 1936
2,080,096	Shick	May 11, 1937
2,244,053	Comstock	June 3, 1941
2,423,177	Cunliffe	July 1, 1947
2,547,104	Whotton	Apr. 3, 1951
2,923,057	Van Urk	Feb. 2, 1960
2,973,574	Kobler	Mar. 7, 1961

FOREIGN PATENTS

523,032	Great Britain	July 3, 1940
535,804	Great Britain	Apr. 22, 1941