May 19, 1970 W. C. SNYDER 3,512,256

DRY LUBRICANT COATED SAFETY RAZOR

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Fig. 1

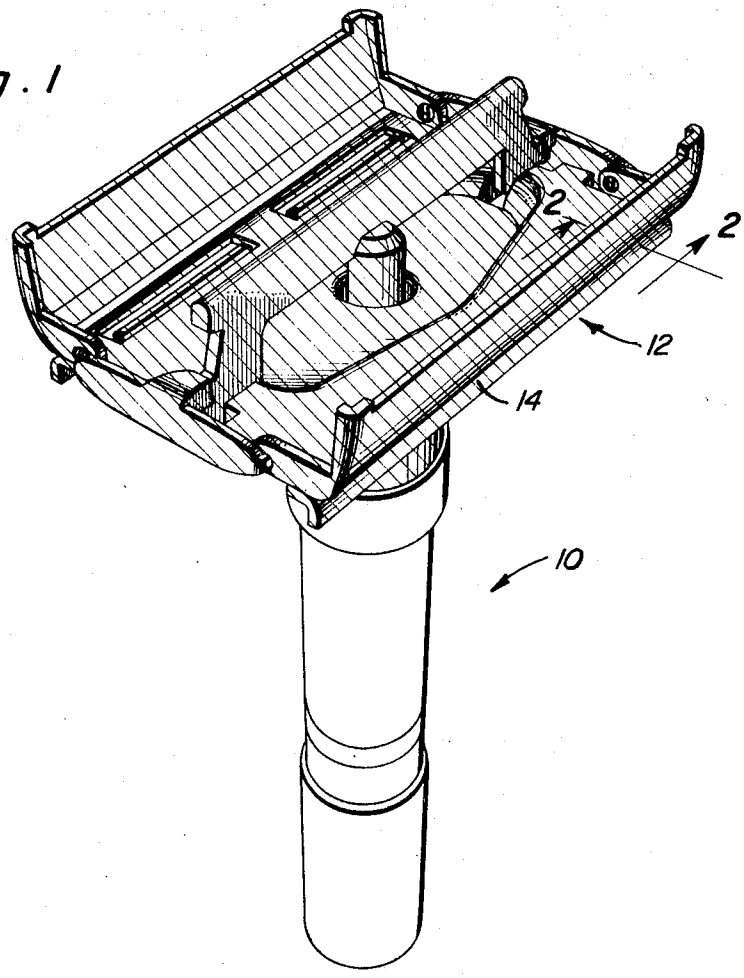
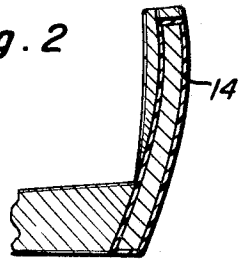


Fig. 2



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DRY LUBRICANT COATED SAFETY RAZOR

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ABSTRACT OF THE DISCLOSURE

A safety razor having the skin-contacting head portion coated with a low coefficient of friction coating consisting of a fused fluorocarbon resin.

The present invention relates to safety razors having head portions characterized by a low coefficient of friction coating. More specifically this invention relates to a safety razor having head portions coated with fluorocarbon resins characterized by a low coefficient of friction.

Attempts have been made heretofore to fabricate safety razor heads in such a manner so as to reduce the frictional drag of the razor to minimize irritation of the skin during shaving. Most commonly such attempts have involved the utilization of smooth chrominum platings, ultrafine polishing procedures or the provision of numerous depressions in the face contacting portion of the razor head so as to retain a substantial amount of emollient, such as shaving cream, adjacent the head of the razor during use. All such proposals were successful to a certain extent but they failed to satisfactorily alleviate other problems normally associated with safety razors among which are the tendency for minerals normally present in the shaving water, and precipitated by the shaving soap, to deposit upon the internal and external working parts of the razor head and the tendency for particles of hair to adhere to the working parts of the razor head thus not only adversely affecting the operation of the working parts of the razor head per se but also tending to make it more difficult to properly position a razor blade therein.

Accordingly, it is a primary object of the present invention to provide a novel safety razor characterized by a head portion which under normal circumstances is highly resistant to corrosion or the accumulation of undesirable foreign material by virtue of the provision of a razor head which is internally and externally coated with a fluorocarbon resin.

Another object of the present invention is to provide a safety razor having a head portion characterized by a low coefficient of friction so as to allow the shaver head to glide very smoothly over the face during shaving with very little friction between the face and the razor head.

A further object of the present invention is to provide a novel safety razor characterized by a head portion internally and externally coated with a low coefficient friction fluorocarbon resin which greatly enhances the ease with which the razor may be operated such as when opening and closing the razor attendant the placement of the razor blade therein.

Still another object of the present invention is to provide a safety razor head characterized by an excellent anti-corrosion barrier which substantially eliminates corrosion of the base metal of the razor head over a substantial period of time.

These together with other objects and advantages which will become subsequently apparent reside in the details of the razor more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a perspective view of an exemplary form of the safety razor having the head portion thereof coated in accordance with the process of the present invention; and

FIG. 2 is an enlarged fragmentary transverse vertical cross-sectional view taken substantially along the plane of the line 2—2 of FIG. 1 and further showing that the internal and external portions of the razor head are provided with a low coefficient of friction coating.

Briefly, the present invention relating to safety razors characterized by head portions having a relatively low coefficient of friction coating comprises the preparation of that portion of the razor head to be coated by utilization of a degreasing step followed by a chemical or abrasive etching of the surface to be coated so as to render it more receptive to the coating to be applied. Subsequent to the aforementioned pretreatment of the head portion of the razor, the razor is preheated, such as when the razor is formed of a ferrous base metal so, as to render the surface of the razor generally passive to rusting, and simultaneously produce a slight oxide layer on the etched surface so as to improve adhesion of a subsequently applied fluorocarbon resin. As soon as the razor has cooled down to a reasonable temperature, subsequent to the preheating as described hereinabove, the actual coating of the head portion of the razor is accomplished by utilizing a dispersion of the powdered or soluble form of suitable fluorocarbon resins such as tetrafluoroethylene (TFE) and fluorinated ethylene propylene (FEP), either pigmented or unpigmented, by conventional methods such as dip-coating, electrostatic spraying, or fluidized bed, for example, when the resins used are in a powdered form.

The synthetic resins utilized in the practice of the present invention are preferably perfluorocarbon polymers and more particularly interpolymers of tetrafluoroethylene and hexafluoropropylene. Durable release coatings of this nature are marketed by the E. I. du Pont de Nemours & Company under the trademark Teflon under the designation TFE and FEP nonstick finishes. Fluorocarbon polymers of this type are disclosed in U.S. Pat. No. 2,946,763, issued July 26, 1960. The aforementioned fluorocarbon polymers are generally supplied with an aqueous carrier and accordingly after the shaver head **12** is coated with an aqueous suspension thereof, it is necessary to heat the resin in order to drive off the aqueous carrier followed by additional heating so as to cure the Teflon to produce a solid dry coating. The temperatures utilized to drive off the carrier and cure the fluorocarbon polymers are within the range of approximately 120° F. to 750° F., for example. More specifically, the process of the present invention for the lubricant coating of shaver heads, such as the exemplary shaver head **12** of the safety razer **10** illustrated, comprises freeing that portion of the razor to be coated from all foreign matter such as grease, oil, etc. by degreasing the parts using chlorothene NU, perchloroethylene, or any similar industrial grade degreasing material. Subsequent to degreasing the metallic surface of the shaver head **12** is rendered more receptive to the fluorocarbon polymer coating by mechanical or chemical etching thereof. It will be appreciated of course that etching is not necessarily mandatory but does assist in achieving maximum adhesion between the coating and the base metal of the shaver head **12**. In this regard, the surface to be coated is preferably treated in such a manner so as to etch the metal to provide a one mil profile. The etching of the base metal may be achieved by an abrasive treatment, such as using a fine or medium aluminum oxide grit or the like either wet or dry. Similarly, the etching of the base metal can also be achieved through the agency of chemical etching, such as by the utilization of suitable chemical solutions. However, the mechanical etching of the surface to be coated is normally preferred.

Subsequent to etching of the base metal it is desirable to preheat the shaver head **12** to 750° F. for approximately 5–10 minutes in order to passivate the surface against rusting, such as when dealing with a razor fabricated from ferrous base metal, and simultaneously produce a controlled oxidation which also improves adhesion of the fluorocarbon polymer resin. It will be appreciated of course that with razor heads made of certain types of low temperature melting alloys, a preheating is not generally possible. However, as indicated hereinabove where ferrous metals are employed preheating is highly advantageous. The coating operation is carried forth as soon as practicable, subsequent to the preheating of the shaver head **12**, so as to take full advantage of the pretreatment of the surfaces of the shaver head **12** to be coated. In this regard, the fluorocarbon polymer suspension may be applied to the shaver head **12** such as by dip coating, compressed air spraying, electrostatic spraying, powdered dispersions of fluidized beds, and the like, fluorocarbon resins utilized. Although it is generally not necessary to provide the shaver head **12** with a primer coating, intermediate of the flourocarbon polymer and the base metal when utilizing fluorocarbon polymers exemplified hereinabove, it will nevertheless be appreciated that in some instances it may be necessary to apply a primer base to the surface of the shaver head **12**.

After coating the shaver head **12** with fluorocarbon resin it is necessary to heat the shaver head **12** with the fluorocarbon resin thereon in order to drive off the carrier and produce a solid dry coating **14**. The curing temperatures are dependent upon the type of fluorocarbon resin selected and for example polytetrafluoroethylene coated shaver heads are first preheated for approximately ten minutes at approximately 180° F. to drive off the carrier and the resin is then cured, i.e., caused to flow into a monolithic tenaciously adhering coating by subjecting to a temperature of approximately 750° F. for approximately 8–12 minutes depending somewhat of course upon the thickness of the base metal. In addition, melt processable fluoronated ethylene propylene should be flashed, i.e., heated to slightly above the volatilization temperature of the carrier liquid, for approximately 20 minutes to drive off the carrier liquid and then cured to create a monolithic coating by heating at approximately 650° F. for about 30 minutes. Furthermore, fluorocarbon resins of the aforementioned type of U.S. Pat. No. 2,946,763 should be flashed for approximately 10 to 15 minutes at a temperature of approximately 300° F.–400° F. then cured at

a temperature of approximately 400–600° F. It has been found that the dual "curing" heat treatments in connection over the aforementioned fluorocarbon resins produces a resinous coating which is somewhat harder than most fluorocarbon resin coatings.

From the foregoing it will be apparent that the present invention provides a dry lubricant coated safety razor **10** of a novel type which greatly facilitates shaving by substantially reducing the coefficient of friction between the shaver head **12** and the skin of the person shaving. In addition, it will also be appreciated that the provision of fluorocarbon polymer coating **14** greatly simplifies the maintenance of the shaver **10** by substantially precluding the accumulation of foreign debris within and upon the elements of the shaver **10** as well as substantially precluding the oxidation or rusting of the base metal thereof.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A safety razor having a head portion consisting of a plurality of interengaged operating elements for removably housing a reusable self-sustaining razor blade therein for shaving therewith and including a thin non-self-sustaining fluoroethylene resin coating intimately bonded to substantially the entire exterior and interior surfaces thereof, said fluoroethylene resin coating simultaneously providing lubrication for that portion of the razor head which contacts the skin of a person utilizing said safety razor and the contiguous working surfaces of the interengaged operating elements.

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