

United States Patent

Tibbals

[15] 3,703,766

[45] Nov. 28, 1972

[54] SAFETY RAZOR BLADE

[72] Inventor: **Edward Camp Tibbals**, 240 Brook Place, Boulder, Colo. 80302

[22] Filed: **July 20, 1970**

[21] Appl. No.: **56,267**

[52] U.S. Cl. **30/346.53, 30/346.58, 76/104 R**

[51] Int. Cl. **B26b 21/54**

[58] Field of Search.....30/346, 53, 346.54, 346.58, 30/346.59; 65/59; 76/DIG. 8, DIG. 9, 11, 12, 104 R

[56] References Cited

UNITED STATES PATENTS

2,217,398 10/1940 Baier 65/59
2,408,790 10/1946 Mack.....30/346.54 X

2,582,913 1/1952 Pfefferle 30/346.59
3,349,488 10/1967 Craig 30/346.53 X
3,543,402 12/1970 Seager 30/346.53

FOREIGN PATENTS OR APPLICATIONS

207,113 12/1939 Switzerland 30/346.59

Primary Examiner—Theron E. Condon

Assistant Examiner—J. C. Peters

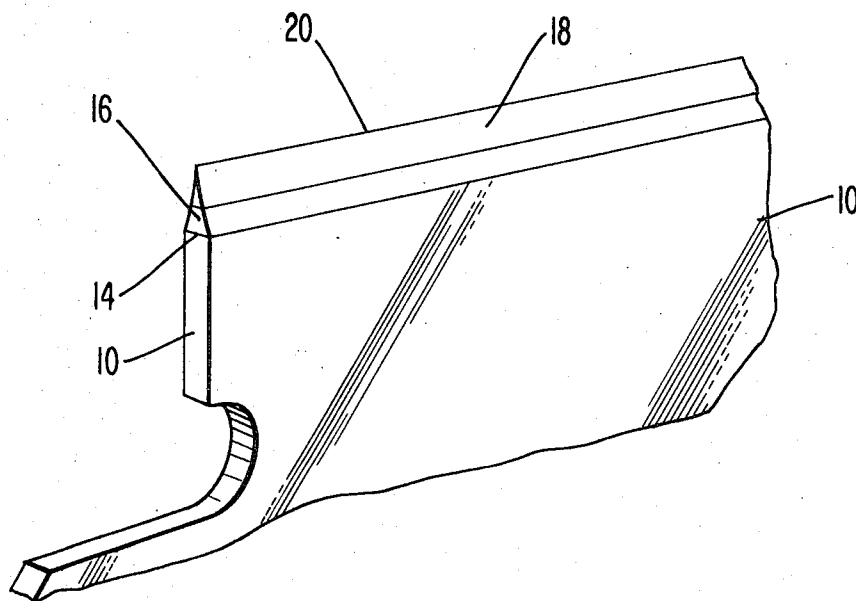
Attorney—Robert E. Isner and Peter J. Franco

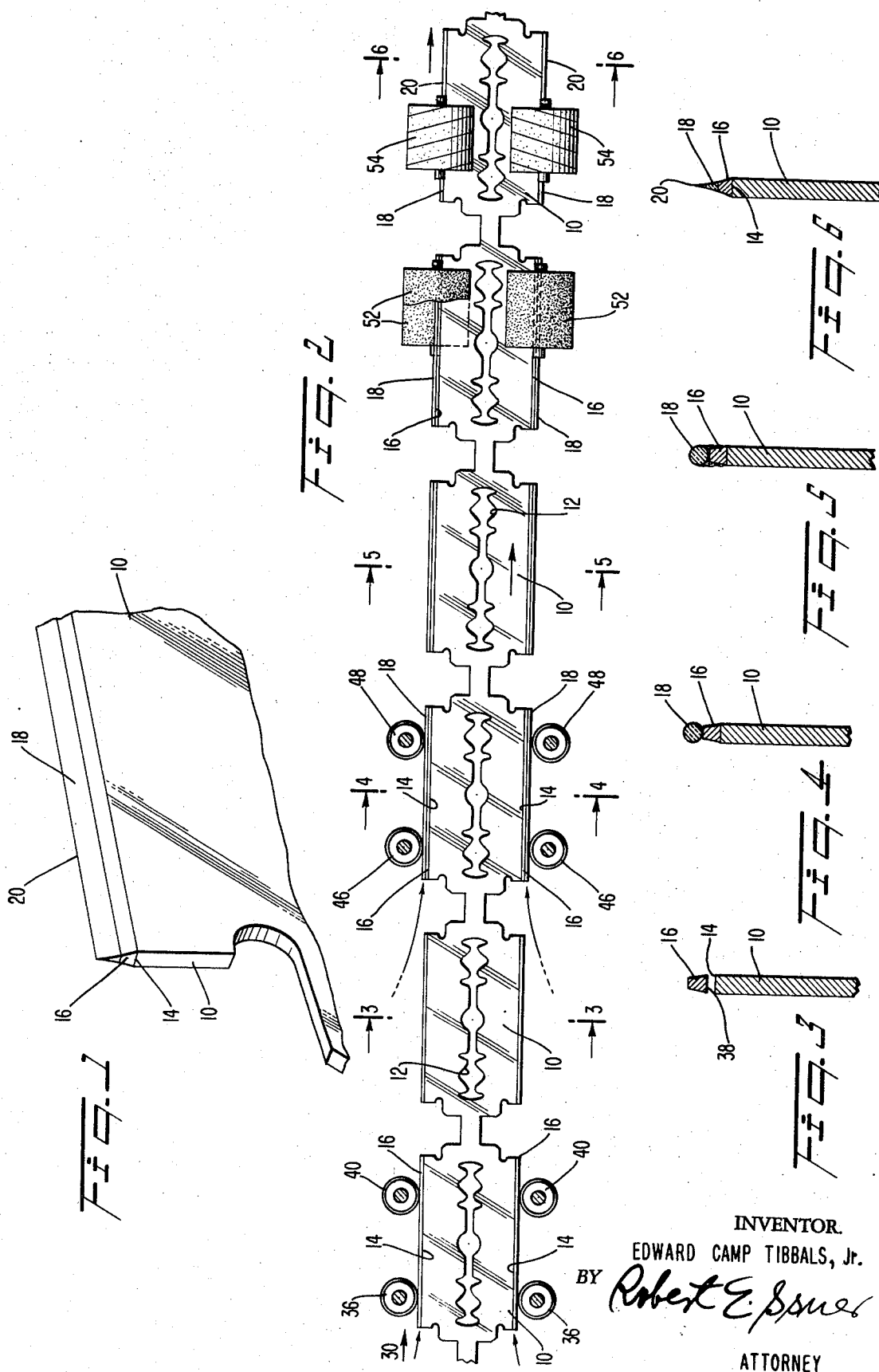
[57]

ABSTRACT

Improved razor blade construction formed of a planar base element having a cutting edge compositely formed of a honed sapphire filament of fine cross section bonded to an intermediate layer of glass.

6 Claims, 6 Drawing Figures





SAFETY RAZOR BLADE

This invention relates to razor blades and particularly to an improved construction for a safety razor blade and method of fabricating the same.

Apart from the utilization of varying alloy compositions for the avowed end of increasing the number of permitted usages thereof before discard, safety razor blades have undergone no basic structural change in the past thirty or more years. Varying alloy compositions at best, due to the nature of the cutting edge, only provide a limited number of permitted additional blade usages before dictated discard and variations therein are effectively circumscribed by economic parameters relating to the costs of the alloy and to the costs and attendant expense of blade fabrication therefrom.

This invention may be briefly described as an improved safety razor blade construction that broadly includes a cutting edge formed from an elongate sapphire filament of fine cross section bonded by means of an intermediate glass or epoxy lamina to the marginal edge of a planar stainless steel substrate. Included within the scope of this invention is a method of fabricating such improved blades.

Among the advantages of the subject invention is the provision of a safety razor blade having a cutting edge of greatly increased durability that is essentially impervious to environment and is selectively degradable only through use thereof. Still further advantages of this invention is the provision of an improved safety razor blade characterized by a markedly reduced cost per usage ratio and by a cutting edge of enhanced sharpness.

The object of this invention is the provision of an improved cutting edge construction particularly adapted to safety razor blades and to a method of fabricating the same.

Other objects and advantages of the subject invention will become apparent from the following portions of this specification and from the appended drawings which, in accord with the mandate of the patent statutes, delineate a presently preferred embodiment incorporating the principles of this invention.

Referring to the drawings:

FIG. 1 is an enlarged and fragmentary oblique view illustrating a safety razor blade constructed in accord with the principles of this invention.

FIG. 2 is a schematic representation, in the nature of a flow diagram, of sequential method steps involved in the fabrication of such improved safety razor blades.

FIG. 3 is a sectional view of a blade subassembly as constituted at the line 3—3 of FIG. 2.

FIG. 4 is a sectional view of a blade subassembly as constituted at the line 4—4 of FIG. 2.

FIG. 5 is a sectional view of a blade subassembly as constituted at the line 5—5 of FIG. 2.

FIG. 6 is a sectional view of a blade as constituted at the line 6—6 of FIG. 2.

Referring to the drawings and particularly to FIG. 1, the improved cutting edge construction and razor blade constructed in accordance with the principles of this invention includes a thin planar and generally rectangularly shaped basal substrate 10 suitably formed of 0.005 to 0.010 inch thick sheet metal and preferably of stainless steel or other rust resisting material and which may contain the usual cutout segments 12 in its body portion to save metal and to facilitate its mounting in a

safety razor. Disposed on at least one of the elongate marginal edges 14 of the basal substrate 10 and having its undersurface bonded thereto is a ribbon-like glass lamina 16, suitably Corning 7520 which bonds and fuses at about 400°C. Bonded to the outer surface of the glass lamina 16 is an elongate sapphire filament element 18 of fine cross section which has been deformed, together with adjacent portion of the glass bonding lamina 16 and substrate 10, in situ, as by grinding and honing, to provide an exposed cutting edge 20. Sapphire is an anisotrope crystal belonging to the rhombohedral class-hexagonal system. Synthetic sapphire, which constitutes a relatively pure single crystal of aluminum oxide, has zero porosity and is chemically stable to all common acids and to most alkalies. Other synthetic crystals of similar character such as doped sapphires (ruby), can be utilized.

Desirably, the edge 14 is preconditioned and cleaned before glass deposition, as by "liquid honing" or by blasting with silica beads after which the edge is cleaned by 4 percent nitric acid in methanol.

Sapphire filaments 18 of the type described and having utility herein are conventionally formed by the flame fusion or Verneuil process and are commercially available in sufficiently long lengths for the above described usage, with the cleavage grain thereof being disposed generally parallel to the longitudinal filament axis so as to facilitate the illustrated cutting edge formation and to minimize detrimental chipping thereof both during the fabrication and in subsequent use thereof.

As will be apparent to those skilled in this art, the subject invention is not limited to any particular configuration of basal substrate and the described multi-element edge construction may be incorporated in one or more substrate edges in accord, for example, with the conventionally available single edge and double edge blade types.

FIG. 2 schematically illustrates the essentials of a presently preferred fabrication method for forming the improved razor blade as illustrated in FIG. 1 and described above. As there illustrated, the basal substrate 10 suitably in the form of an elongate strip of preformed stainless steel or the like is advanced in the direction indicated by the arrow 30 and discrete glass lamina 16 is introduced into overlaying interfacial relation with the exposed marginal edge 14 of the advancing substrate 10 and maintained in pressure contact therewith by pressure rollers 36 and 40 during the high temperature bonding thereof. As best shown in FIG. 3, the glass ribbon is preferably of trapezoidal cross section having its base 38 of a width substantially equal to the width of the exposed marginal edge 14. The upper surface of the glass lamina 16 is of lesser width but sufficient to provide a base for subsequent bonding of the sapphire filament 18 thereto. When properly positioned, bonding of the undersurface 38 of the glass lamina 16 to the exposed edge 14 of the substrate 10 is conventionally effected as by the application of heat in association with pressure roller means 36 and 40.

Following the bonding of the glass lamina to the exposed edge, an elongate sapphire filament 18 of the type described is annealed, suitably in batch form for almost 2 hours at 1,875°C; and subsequent to the anneal, is placed into overlaying superposed relation on

the exposed upper surface of the glass lamina 16. Bonding of the annealed filament 18 to the glass lamina as illustrated in FIG. 5, is again conventionally effected by the application of heat in association with pressure roller means 46 and 48. As shown in FIG. 5, during such bonding the essential cylindrical filament will be somewhat embedded in the glass lamina to thereby provide a maximum degree of interfacial contact therebetween. With the subassembly so formed, further displacement of the substrate 10 in the direction indicated by the arrow will sequentially introduce the compositely formed edge portions thereof into a grinding and honing station as schematically illustrated by the grinding roll means 52 and honing roll means 54. The grinding and honing station conventionally deforms the composite edge portion into a sharp cutting edge that is selectively constituted by the sapphire filament material. By proper grinding and honing an edge having a radius that is only a very small fraction, say 1 percent or so, of that conventionally obtained with steel blades, is attainable.

Following the above series of operations to form the cutting edge, the substrate is then further treated in a conventional manner to separate the same into individual blades having any desired cutout configuration 12 in the body portion thereof to accommodate mounting and desired positioning of the blade in a safety razor assembly.

In lieu of the intermediate glass bonding layer 16 a bonding layer of other material may be employed. For example, an epoxy resin such as Hysol 1 hour epoxy

resin may be utilized.

Having thus described my invention, I claim:

1. A safety razor blade comprising a thin planar substrate including an elongated marginal edge, and an elongated substantially monocrystalline filament of aluminum oxide having the cleavage grain thereof disposed substantially parallel to the longitudinal axis of said elongated filament secured to said elongated edge of said thin planar substrate and selectively shaped to form an acute angle cutting edge.
2. The razor blade construction as set forth in claim 1 wherein said substrate is stainless steel.
3. A safety razor blade according to claim 1, wherein said filament is sapphire and said safety razor blade further comprises means for securing said sapphire filament member to said elongated edge of the thin planar substrate.
4. A safety razor blade according to claim 1 including an intermediate lamina selectively bonded to said elongated marginal edge and to said filament member for securing the latter thereto.
5. The razor blade construction as set forth in claim 4 wherein said intermediate lamina is constituted from the group consisting of glass and epoxy resin.
6. The razor blade construction as set forth in claim 4 wherein said intermediate lamina is a glass of generally trapezoidal cross sectional configuration.

* * * * *

35

40

45

50

55

60

65