June 3, 1924. 1,496,296

H. M. CHANCE

SAFETY RAZOR

Filed Aug. 11, 1921 2 Sheets-Sheet 1

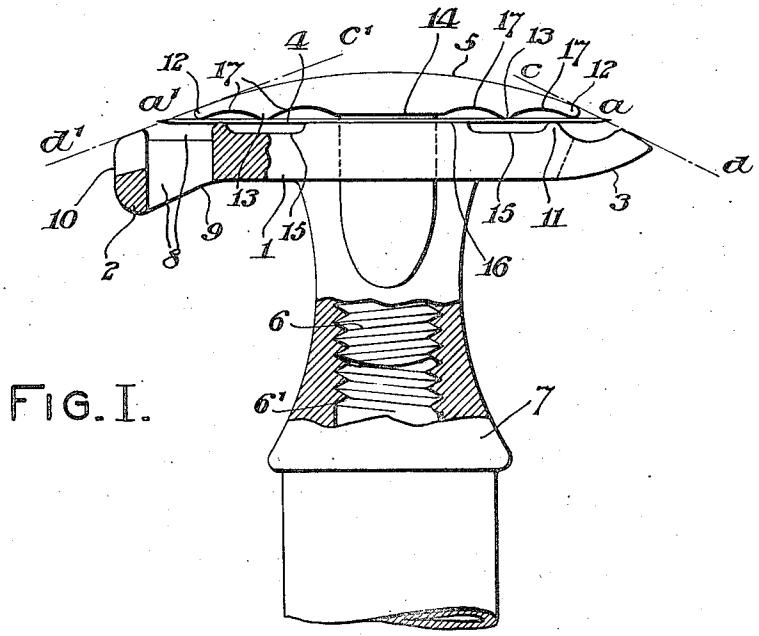


FIG. I.

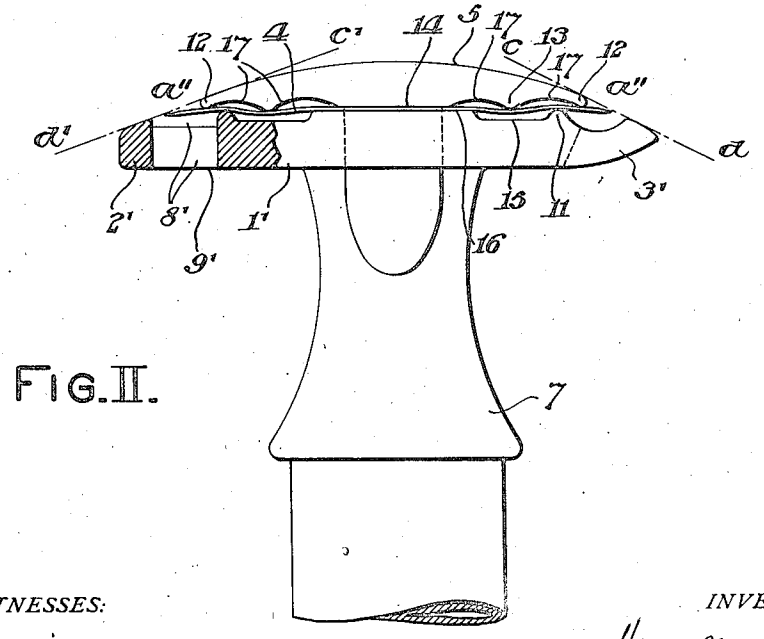


FIG. II.

WITNESSES:

E. R. Barnard.

INVENTOR.

Henry M. Chance

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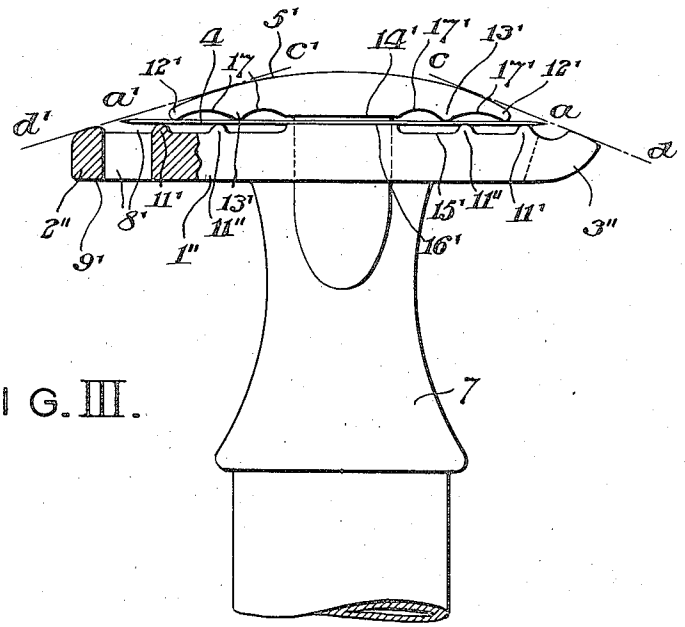


FIG. III.

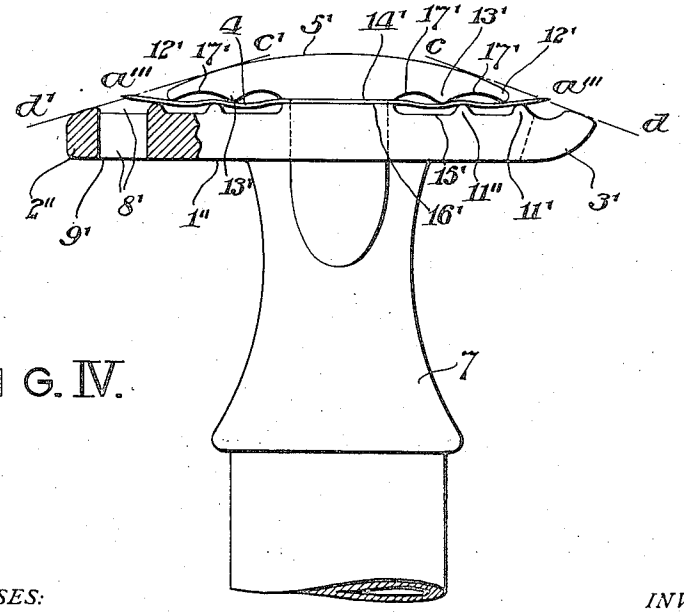


FIG. IV.

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Patented June 3, 1924. 1,496,296

UNITED STATES PATENT OFFICE.

HENRY M. CHANCE, OF PHILADELPHIA, PENNSYLVANIA.

SAFETY RAZOR.

Application filed August 11, 1921. Serial No. 491,547.

To all whom it may concern:

Be it known that I, HENRY M. CHANCE, a citizen of the United States, residing at Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Safety Razors, whereof the following is a specification.

My invention relates to means for the application to adjustable safety razors of the Gillette type, of an improvement in safety razors which I have described and claimed in an application for patent Serial No. 486,146, filed July 20, 1921, for improvement in safety razors which consists in confining the adjustability of the cutting edge of such razors within a range between two fixed limits, one of which provides little or no exposure of the cutting edges and the other of which provides maximum exposure of the cutting edges consistent with a reasonable degree of safety in use.

In adjustable safety razors as usually constructed, when the parts are assembled in position but before the blade is flexed by tightening the clamp, the cutting edges of the blade project beyond lines tangent to the outside faces of the clamp and guard and are about $\frac{1}{16}$ of an inch above the guard, presenting an exposure of the cutting edges much exceeding that possible for safe use; but when the blade is flexed by progressive tightening of the clamp, the cutting edges move towards the guard until they reach a position in which they project very slightly beyond a line tangent to the outside faces of the clamp and guard, presenting a very small exposure of the cutting edges of the blade and a high degree of safety in use. The adjustability of the cutting edges of the blade is through a range extending by imperceptible graduations from a position in which the cutting edge is dangerously exposed to one in which there is very small, if any, exposure. After clamping tightly, with the cutting edges occupying a position with minimum exposure, a very slight reduction in the clamping pressure by a movement of the clamp or cover a few thousandths of an inch is sufficient to increase the exposure of the cutting edges to the maximum exposure consistent with safety, further reduction in the clamping pressure with but slight movement of the clamp or cover increasing this exposure to one inconsistent with safety in use.

Fig. I is an end view of a razor of the Gillette type showing modifications in the construction of holder and clamp to confine the adjustability of the exposure of the cutting edges of the blade to within safe limits, the drawing showing the clamp 5 tightened upon the blade 4, but without producing appreciable flexing thereof and showing the blade with about the maximum exposure consistent with safety and adapted to close shaving.

Fig. II shows the same construction illustrated by Fig. I but with the blade tightly clamped and flexed to the limit of possible flexure, in which position the cutting edges have very small or perhaps no exposure, this position being adapted to less close shaving than that shown by Fig. I.

Fig. III is a similar end view in which tightening of the clamp or cover 1 will flex the razor blade in a direction opposite to that of the construction illustrated by Figs. I and II. In this Fig. III the clamp, 5, is shown tightened upon the blade, 4, but without sufficient pressure to produce appreciable flexing of the blade. In this position the cutting edges of the blade have little or no exposure and their position with relation to the guards is one adapted to ordinary shaving conditions. In this type of construction, tightening of the clamp, 5, increases the exposure of the cutting edge. Fig. IV is a reproduction of Fig. III showing the condition when the clamp 5 is tightened to the limit of motion, thus producing the maximum flexing of the blade, corresponding to maximum exposure of its cutting edges consistent with safety in use and providing a condition adapted to close shaving.

In the drawings like numbers refer to like parts. The drawings are made on a scale enlarged to about four (4) times the most convenient size for razors of this type.

Fig. I is an end and partly cross-sectional view comprising a holder 1, a guard 2, shown as a bar surmounted by teeth 10 forming a comb and separated from the holder 1, by an open slot 8, but connected to the holder 1 at each end by a wing 9; another guard 3 is shown as a toothed guard of a common type, the upper surface of the teeth being hollowed out to form a channel, 4 is a transversely flexible two-edged razor blade with cutting edges at "a" and "a'", 5 is a clamp or cap having a threaded bolt 6 adapted to engage with an internal thread 6′ cut on the inner wall of the handle 7,

The holder 1 is provided with a raised ridge 11 at both sides which acts as a fulcrum on which the blade 4 may be flexed. The cover 5 is provided with outer raised ridges 12 for flexing the blade 4 and also a second raised ridge 13, and has a broad ridge in the form of a contact plane 14 which is not in contact with the blade until flexing of the blade commences, and limits the movement of the clamp 5 to prevent flexing of the blade beyond the predetermined limit. The holder 1, is provided with a similar contact ridge 16, which co-acts with ridge 14 to limit the movement of the clamp 5. It will be understood that the contact ridge 16 may be lowered provided a corresponding change be made in contact ridge 14, without materially affecting the action of these two contact ridges in limiting the downward movement of the clamp 5 in the desired manner. In this Fig. I the clamp 5 is shown tightened upon the blade 4, thus producing pressure on the blade along the lines of contact 12 and 13, this pressure being opposed by counter-pressure along the line of contact 11 and by the contact plane 16, the pressure thus applied being sufficient to hold the blade firmly in place in a position adapted to close shaving with the cutting edge slightly projecting beyond the line *c—d* drawn tangent to the clamp 5 and guard 3, but the pressure so applied not being sufficient to produce appreciable flexing of the blade 4.

All the drawings show guards of the bar type and an open slot on the left hand side of the holder and toothed guards of the comb type with their upper surfaces shaped to form a channel on the right hand side. It will be understood that the holder may be made symmetrical with guards either of the curved tooth type or of the bar and open slot type on both sides.

In Fig. II which is a duplication of Fig. I except that the guard 2′ is shown as a simple bar without teeth, the clamp 5 is shown as tightly drawn down upon the blade until the contact planes 14 and 16 are both in contact with the blade 4. In moving from the position shown in Fig. I. to that shown in Fig. II, the ridges 12 and 13 of clamp 5, co-acting with ridge 11 and contact plane 16, flex the blade 4 in a reversed curve, thus producing longitudinal corrugations which tend to stiffen the blade longitudinally, and also produce a flexing near the cutting edge *a″* that lowers the cutting edges slightly below the line *c—d*, thus providing for a very small or no exposure, a condition adapted to shaving with a high degree of safety, but not to what is ordinarily described as "close" shaving.

In Fig. III the relative positions of the flexing ridges on the clamp and on the holder are so located that flexing of the blade 4 causes a movement of the cutting edges in an opposite direction to the movement shown by Figs. I and II, progressive tightening of the clamp increasing the exposure of the cutting edges from a position with little or no exposure, to a maximum exposure consistent with safety in use as shown by Fig. IV. In this application of my invention the clamp 5 does not extend over the channel formed by the upper surfaces of the teeth of the guard 3 as shown by Figs. I and II, nor over the open slot adjacent to guards 2 and 2′ of Figs. I and II.

It will be understood that the ridges on the surfaces of the holder and clamp may be relatively wide, or narrow, or with sharp, flat, or rounded crests; the crests of symmetrical corrugations upon said surfaces may be used as such ridges, and the crest of the ridges on the holder may be located midway between that of those on the clamp and vice versa. To confine the adjustability of the cutting edges of the blade to exposures of the cutting edges that are within the limits of safety in use, it becomes necessary to make the actual movement of the parts by which flexing of the blade is produced very small, because the maximum permissible change in position of the cutting edges is limited to a few thousandths or to one or two hundredths of an inch, if a proper degree of safety in use is to be assured.

In using extremely thin blades such as those of the Gillette type, having a thickness of 5 to 10 thousandths of an inch, which are quite flexible under slight pressure, if the blade is to be firmly clamped in its initial position with pressure sufficient to hold the cutting edge firmly in place but without producing appreciable flexing of the blade, the application of the pressure and of the counterpressure by which flexing is to be accomplished must be at points which are very close together, but the resistance of the blade to flexing may be increased by supporting the blade, as illustrated by the drawings at one or more points intermediate those near the ends of the blade, thus dividing the blade longitudinally into two or more narrow sections each of which will present greater resistance to flexing than the whole blade if flexed as a unit. It is thus possible to apply sufficient clamping pressure to hold the blade firmly in place for use without appreciably flexing it or materially changing the position of the cutting edges; and to effect such flexing and the desired adjustment of the cutting edges by increase in the clamping pressure.

When applying my improvement by these or other means it is desirable to limit the relative movement of the clamp and holder, by means of a ridge or projection on the clamp

or holder, or on both, which will prevent further movement where the maximum or minimum degree of flexing has been reached. This provides a means of limiting the clamping pressure and the flexing to which the blade can be subjected, and is also a safeguard against cracking or deforming of the blade by subjecting it to an excessive stress. The actual movement of the cutting edges between the defined limits is so small that it has been necessary to somewhat exaggerate it in the drawings to make the construction plain.

It will be evident to those skilled in the art that my invention may be carried out with holders, clamps, guards and clamping means other than those shown by the drawings used to illustrate my invention, and that the method of clamping the blade to secure rigidity and stiffness may be applied to both rigid and flexible holders and clamps. I have utilized the right half of each drawing to illustrate the use of guards of the bar type with or without teeth, and separated from the holder by an open slot over which the cutting edge of the razor blade projects, because this form of guard and the slot behind it have several advantages over the comb type of guard with or without an interposed channel between the teeth and the cutting edge. These advantages are, less obstruction in front of and below the cutting edges, greater facility for the escape of lather, cut hairs, etc. from the vicinity of the cutting edges, smooth passage of the bar over the skin, the wiping away of superfluous lather from the hairs immediately before they are intercepted by the cutting edge and ease in cleansing the holder, guards and blade after use.

The term "reversed curve" in the specification and the claims hereof is used to designate a compound curve in which the direction of curvature changes, as in one in which the centers of curvature are on opposite sides of the curve, thus in Fig. II the blade between contact points 12, 11 and 13 is flexed in a reversed curve, and the blade between 13, the shoulder of 16 and the shoulder or edge of 14, is flexed in another reversed curve, and the left hand half of the blade is similarly flexed in two reversed curves, making 4 reversed curves in all. If the ridge 13 be omitted the flexure of the blade is effected by ridges 12, 11, 16 and 14 on each side which will produce a reversed curve in the blade on each side of its center, or two reversed curves in all. Similarly in Fig. IV the ridges or lines of contact 11′, 12′, 11″, 13′, 14′ and 16′, on each side produce two reversed curves in both the right and left hand halves of the blade, or four in all, which are reduced to two in all if the ridges 13′ and 11″ be omitted from both sides. Figs. I and II illustrate the use of 3 ridges on the holder and 5 on the clamp, and Figs. III and IV illustrate the use of 5 ridges on both holder and clamp. It is apparent that the number of reversed curves, or corrugations produced in the blade will depend upon the number of ridges or lines of flexing contact upon the holder and clamp, and these may be increased, or decreased, from those shown by the drawings, the ridges dividing the blade into two or more relatively narrow sections which present greater resistance to flexing than the whole blade if flexed as a unit, the blade thus being bent into two or more corrugations, with corresponding increase in its longitudinal stiffness. When the blade used is not one likely to be damaged by the pressure to which it is subjected by tightening of the clamp, the resistance of the blade to further flexing becomes a means for limiting the adjustability of the cutting edge in one direction, and actual contact of the blade and of ridges 14 and 16 to effect such limitation becomes unnecessary. The resistance of the blade to flexing increases rapidly as the span between the ridges is decreased, the deflection caused by the application of a given pressure varying inversely with the cube of the span between the two ridges upon which the flexing force is applied, thus in Fig. I where the span on the holder 1, between ridge 11 and the edge of ridge 16 is about $\frac{1}{5}$ of the width of the razor blade, the force necessary to produce a given deflection in this span is, theoretically, 125 (the cube of 5) times that necessary to produce the same deflection if the blade be flexed as a whole. It is therefore apparent that if the span be small enough a relatively large pressure may be applied without causing an appreciable flexing of the blade, thus making it possible to utilize the resiliency of the blade to keep constant stress upon the means used for clamping, thus preventing the clamp from easily becoming loose, without producing an appreciable flexing, or movement of the cutting edges of the blade, large enough to change the adjustment of the cutting edges from the desired position. My improvement may therefore be applied to the construction of a safety razor, or safety razor blade holder, as a means for holding the cutting edge firmly in a position best adapted to average shaving conditions, without adjustable flexing of the blade.

In this specification and the claims hereof, the word "exposure" is used to designate the distance by which the cutting edge of the razor blade projects beyond a line tangent to the outer surface of the clamp and to the outer surface of the guard, such tangents being shown on the drawings by broken lines lettered c—d, and c'—d'.

Applicant does not herein claim limitation

of the range of adjustment in adjustable safety razors to within safe limits, except in combination with the types of construction herein described and shown, as limitation of the range of adjustment to within safe limits has been broadly claimed in another application filed by applicant July 20, 1921 for improvement in safety razors, Serial No. 486,146.

Having described my invention, I claim:

1. An adjustable safety razor comprising in combination a holder with guards, a transversely flexible two-edged razor blade, a clamp for clamping said blade to said holder, means for clamping said holder, blade and clamp firmly together, a plurality of parallel longitudinal ridges on the surfaces of said clamp, and of said holder adapted to contact with said razor blade and so spaced that said ridges on the holder are not directly opposite to those on the clamp, said ridges projecting from said holder and said clamp a distance sufficient to permit said blade to be flexed without coming into controlling contact with said holder and said clamp except along its lines of contact with said ridges, whereby upon application of sufficient clamping pressure said blade is transversely flexed in a plurality of reversed curves or corrugations and whereby the position of the cutting edges of said blade in relation to their respective guards is changed.

2. A holder for an adjustable safety razor comprising in combination a holder with guards and a clamp adapted to hold a two-edged transversely flexible razor blade, means for clamping said holder, clamp and such a razor blade firmly together, a plurality of parallel longitudinal ridges on the surface of said holder and of said clamp adapted to contact with such razor blade when such blade is inserted between said holder and clamp and clamping pressure is applied, said ridges being so spaced that those on the said holder are not directly opposite to those on said clamp, said ridges projecting from said holder and said clamp a distance sufficient to permit said blade to be flexed without coming into controlling contact with said holder and said clamp except along its lines of contact with said ridges, whereby upon application of sufficient clamping pressure said blade will be transversely flexed in a plurality of reversed curves or corrugations and whereby the position of the cutting edges of said blade with reference to their respective guards is changed.

3. A safety razor including a holder having a guard, a handle for said holder, a clamp engaging said holder, a flexible blade between clamp and holder, said clamp engaging said blade along four substantial lines, means to cause said clamp to approach said holder, whereby said blade is simultaneously flexed and counter-flexed.

In witness whereof I have hereunto set my hand this 10th day of August 1921.

HENRY M. CHANCE

Witnesses:
GEORGE MARX,
CHAS. BUSH.