May 26, 1936. G. BINIEK 2,042,293

SAFETY RAZOR WITH ROTARY DRIVE

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Fig.1

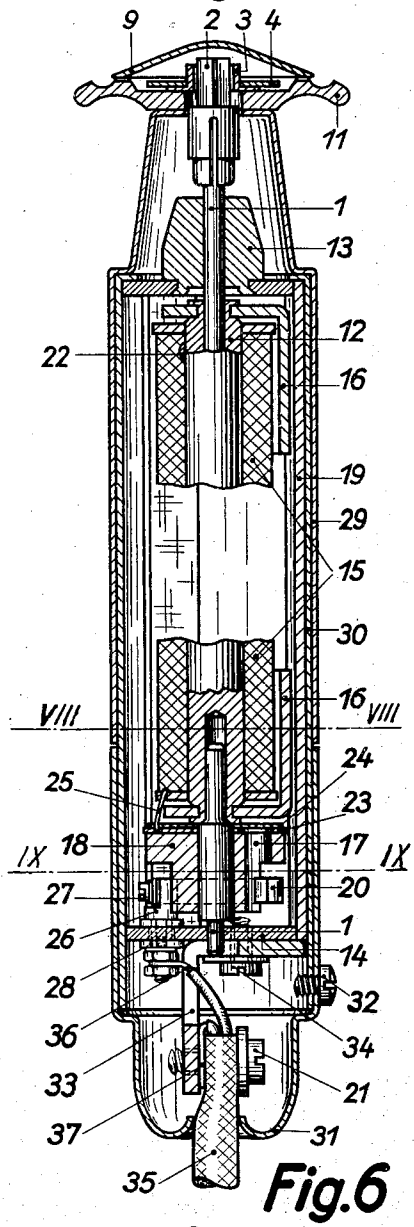


Fig.2

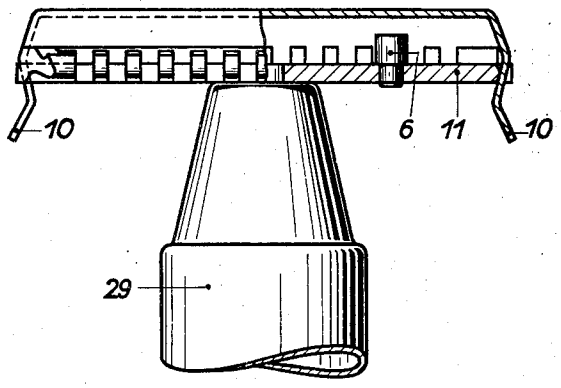


Fig.3

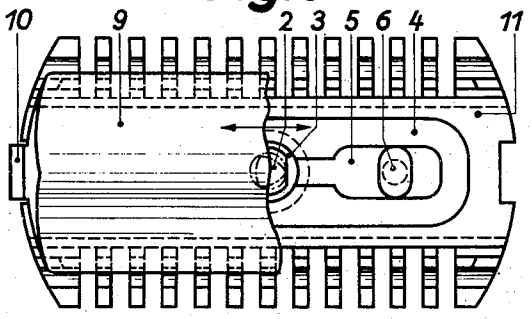


Fig.4

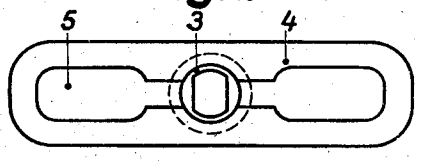


Fig.5



Fig.6

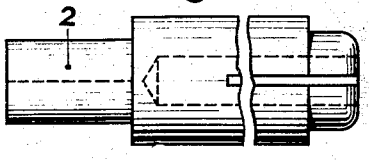
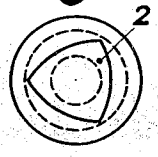


Fig.7



Inventor:

Georg Biniek

G. Gerstenberg

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Fig. 8.

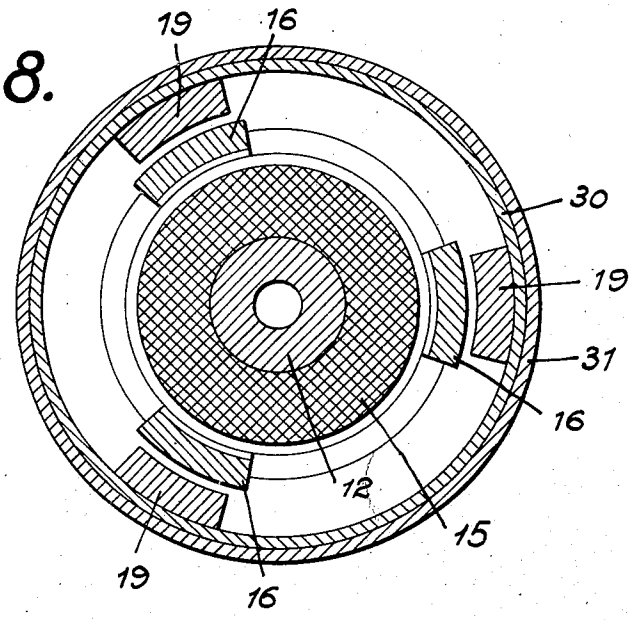
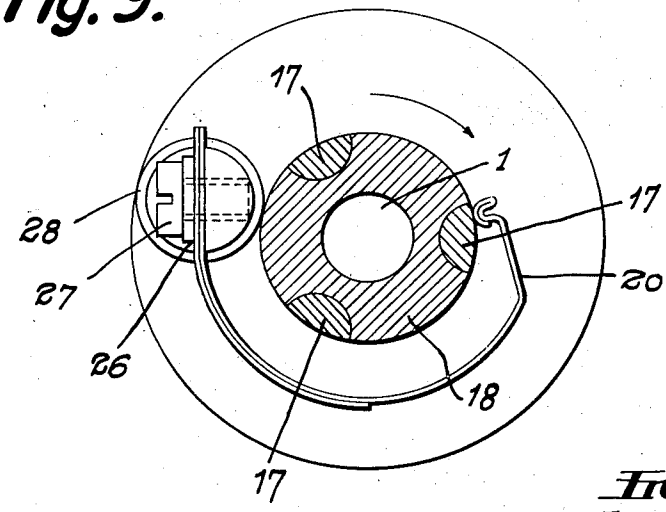


Fig. 9.



Inventor:
GEORG BINIEK
by Fitz & Kehlenbeck
Attorneys.

UNITED STATES PATENT OFFICE

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SAFETY RAZOR WITH ROTARY DRIVE

Georg Biniek, Berlin-Charlottenburg, Germany, assignor to Telephon - Apparat - Fabrik E. Zwietusch & Co. G. m. b. H., Charlottenburg, Germany

Application November 3, 1932, Serial No. 640,991
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4 Claims. (Cl. 30—45)

This invention relates to a safety razor with rotary drive and consists chiefly of an arrangement serving to convert the rotating movement into a reciprocating movement for driving the blade. In the known safety razors, in which a rotary driving device is employed, which may consist of an electric motor or of a spring motor, an eccentric which rotates in a guide sleeve is employed for converting the rotating movement into the reciprocating movement necessary for actuating the blade. It is particularly advantageous for the shaving operation for the blade to be reciprocated very quickly. This can be attained by a drive rotating at a high speed or by interposing a separate transmission gearing. The fitting of a transmission gearing considerably increases the cost of the apparatus and presents a source of trouble; moreover the apparatus is thereby rendered inconvenient to handle. The speed of rotation of the drive can also not be increased as desired.

According to the invention the number of reciprocating movements can be increased in a simple manner without increasing the speed of rotation of the drive by employing an odd cornered or triangular cam instead of an eccentric. The advantage of the triangular cam consists in that one rotating movement produces three reciprocating movements. The employment of a triangular cam is particularly advantageous when an electric motor with, for example, a three-part rotor is employed as driving device, the triangular cam being keyed on the shaft of the motor so that the movement is imparted to the blade by the cam at the moment of strongest attraction. In this manner it is possible, to use a motor with a very small power for driving the blade. The small power of the motor is extremely important for the safety razor as a drive with large power current should be avoided on account of the extreme danger to which the user of the safety razor is subjected.

The embodiment of the invention hereinafter described employs a specially designed motor for which an ordinary pocket lamp battery is sufficient as source of current.

In the drawings:

Fig. 1 shows in longitudinal section the safety razor on an enlarged scale.

Fig. 2 shows in part section the blade and guard plate in side elevation.

Fig. 3 shows in top plan view the safety razor with the cover plate partly broken away.

Fig. 4 is a top plan view of the guide plate for the blade.

Fig. 5 shows in side elevation the guide plate for the blade.

Fig. 6 shows the guide pin in part elevation.

Fig. 7 shows the guide pin in end view.

Fig. 8 is a section on line VIII—VIII of Fig. 1.

Fig. 9 is a section on line IX—IX of Fig. 1.

In Fig. 1, a guide pin 2 in the form of a triangular cam is keyed on the shaft 1 of the driving motor. The contour of the guide pin 2 is shown in Fig. 7. This contour as shown has the form of an arcuate equilateral triangle, the three corner points of which are equidistant from each other, and the sides of which are arcs of circles centered on the respective opposing corners of the triangle. With this arrangement it is possible for the arcuate equilateral triangle to operate without play in every position between two parallel surfaces, the spacing of which corresponds exactly to the radius of said arcs. The guide pin 2 rotates in a sleeve 3, which is inserted in a guide plate 4. The guide plate 4 has slots 5 by means of which the plate 4 is guided on pins 6 on a guard plate 11. The bore in the sleeve 3 is substantially of rectangular cross section. Owing to the rotation of the pin 2 in the sleeve 3 the guide plate 4 is reciprocated in the direction of the arrow, Fig. 3. The hub-like projection of the guide sleeve 3 serves at the same time for fixing the blade 8, see Fig. 5 in which said blade is indicated in dotted lines. The blade 8 is held against the guard plate 11 by means of the cover plate 9 with a small amount of play for its movement. The cover plate 9 is provided with two resilient extensions 10 by means of which it is held easily detachable on the guard plate 11.

The drive for the shaft 1 consists, as shown in Fig. 1, of a specially designed motor. The rotor of this motor consists of an iron core 12, on which the shaft 1 is fixed, and which is journalled at 13 and 14. A cylindrical coil 15 is wound around the core 12 and pole pieces 16 are fixed on its ends. One end of the winding of the coil 15 is soldered to the core 12 at the point 22 and thus connected to the casing of the razor which is in turn connected to one pole of the driving battery by the clamping screw 21. The other end of the winding of the coil 15 is connected to the contact segments 17 of a commutator 18. The contact segments 17 are displaced through 120° in a similar manner to the pole pieces 16 and are riveted in the metal plate 23 which is connected to the coil 15 by a wire 25. The metal plate 23 is insulated from the iron core 12 by an insulating disc 24. In the handle of the casing three conductors 19 are fixed which are likewise arranged 120° apart as shown in Fig.

8. A contact spring 20 rubs against the commutator 18, the length of this spring relative to the conductors 19 being so chosen that the contact spring contacts with the contact segment 17 of the commutator 18 when the pole pieces 16 have just moved into the central position between two conductors 19. The contact surface of a contact segment 17 is so chosen that the circuit closing for the coil 15 is maintained until the pole pieces 16 register with the conductors 19. The rotor continues to rotate owing to its momentum without the influence of the magnetic attraction until the next contact segment 17 again comes into contact with the brush 20. It may happen when switching in the apparatus that the brush 20 is not actually in contact with one of the contact segments 17. By turning the handle slightly the brush 20 is pressed against one of the contact segments 17 owing to the inertia effect of the heavy rotor.

The contact spring 20 is attached to the screw bolt 26 by means of a screw 27 as shown in Figs. 1 and 9. The screw bolt 26 is insulated from the plate 14 by a sleeve 28 of insulating material. One wire 36 of the cable 35 is connected to the screw bolt 26 whereas the other wire 37 of the cable leading to the battery is connected to the angle piece 33 by means of a screw 21. The angle piece 33 is fixed on the plate 14 by a screw 34. For protecting the motor against the penetration of moisture, it is accommodated in a metal sleeve 30 over one end of which a cap 31 is slipped which cap is fixed to the sleeve 33 by a screw 32. Over the other free end of the sleeve 30 a tube 29 fixed to the guard plate 11 is slipped and for the purpose of cleaning the safety razor the tube 29 can easily be pulled off the sleeve 30 so that the portion of the razor containing the motor does not require to be dipped in water when cleaning the razor after use.

I claim:—

1. In a safety razor with reciprocating blade, a reciprocating holder for said blade, said holder provided with a central opening having two parallel inner surfaces extending perpendicularly to the operative path of the blade, a weak current motor in the handle of the razor, said motor having its shaft perpendicular to the plane of the blade, and a triangular cam at the end of said shaft, said cam extending into the central opening of said blade holder and provided with outwardly curved side surfaces adapted to develop a rolling action on the inner surfaces of said central opening to thereby smoothly reciprocate said blade holder without jars, pole pieces and commutator contact segments in said motor, said motor having a division of the pole pieces and contact segments of the commutator corresponding to the number of sides of the triangular cam, said cam surfaces and said motor parts being so positioned relative to each other that movement is imparted to said blade and holder by the cam at the moment of strongest attraction between said pole pieces and said contact segments.

2. In a safety razor with reciprocating blade, a reciprocating holder for said blade, said holder provided with a central opening having two parallel inner surfaces extending perpendicularly to the operative path of the blade, a weak current motor in the handle of the razor, said motor having its shaft perpendicular to the plane of the blade, and a triangular cam at the end of said shaft, said cam extending into the central opening of said blade holder and provided with outwardly curved side surfaces adapted to develop a rolling action on the inner surfaces of said central opening to thereby smoothly reciprocate said blade holder without jars, said motor having a cylindrical coil surrounding said shaft, three pairs of poles circumferentially spaced apart through 120°, three stationary force line members secured in said handle, a commutator fixed on the motor shaft and provided with three spaced contact segments connected with each other and with said coil, and a stationary contact brush slidable over said commutator segments and adapted to make and break the circuit through the cylindrical coil three times respectively during each rotation of said commutator, said cam surfaces and said motor parts being so positioned relative to each other that movement is imparted to said blade and holder by the cam at the moment of strongest attraction between said pole pieces and said contact segments.

3. In a safety razor with reciprocating blade, a reciprocating holder for said blade, said holder provided with a central opening having two parallel inner surfaces extending perpendicularly to the operative path of the blade, a weak current motor in the handle of the razor, said motor having its shaft perpendicular to the plane of the blade, and a triangular cam at the end of said shaft, said cam extending into the central opening of said blade holder to reciprocate said blade holder, pole pieces and commutator contact segments in said motor, said motor having a division of the pole pieces and contact segments of the commutator corresponding to the number of sides of the triangular cam, said cam surfaces and said motor parts being so positioned relative to each other that movement is imparted to said blade and holder by the cam at the moment of strongest attraction between said pole pieces and said contact segments.

4. In a safety razor with reciprocating blade, a reciprocating holder for said blade, said holder provided with a central opening having two parallel inner surfaces extending perpendicularly to the operative path of the blade, a weak current motor in the handle of the razor, said motor having its shaft perpendicular to the plane of the blade, and a triangular cam at the end of said shaft, said cam extending into the central opening of said blade holder to reciprocate said blade holder, said motor having a cylindrical coil surrounding said shaft, three pairs of poles circumferentially spaced apart through 120°, three stationary force line members secured in said handle, a commutator fixed on the motor shaft and provided with three spaced contact segments connected with each other and with said coil, and a stationary contact brush slidable over said commutator segments and adapted to make and break the circuit through the cylindrical coil three times respectively during each rotation of said commutator, said cam surfaces and said motor parts being so positioned relative to each other that movement is imparted to said blade and holder by the cam at the moment of strongest attraction between said pole pieces and said contact segments.

GEORG BINIEK.