

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 618 853 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
13.03.1996 Bulletin 1996/11

(21) Application number: 93901709.1

(22) Date of filing: 18.12.1992

(51) Int. Cl.⁶: **B26B 19/04**

(86) International application number: PCT/EP92/02960

(87) International publication number:
WO 93/12916 (08.07.1993 Gazette 1993/16)

(54) **DRY-SHAVING APPARATUS**

TROCKENRASIERGERÄT

APPAREIL DE RASAGE A SEC

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL
PT SE

(30) Priority: 20.12.1991 GB 9127102
20.12.1991 GB 9127092

(43) Date of publication of application:
12.10.1994 Bulletin 1994/41

(60) Divisional application: 95109208.9

(73) Proprietor: THE GILLETTE COMPANY
Boston, Massachusetts 02199 (US)

(72) Inventors:
• WETZEL, Matthias
D-60318 Frankfurt (DE)

• ROYLE, Terence Gordon
Wokingham, Berkshire PG11 3PG (GB)
• PARSONAGE, Raymond Graham
Maldenhead, Berkshire SL6 5AE (GB)

(74) Representative: Avery, Stephen John et al
Hoffmann, Eitle & Partner,
Patent- und Rechtsanwälte,
Arabellastrasse 4
D-81925 München (DE)

(56) References cited:

EP-A- 0 077 093	EP-A- 0 361 200
DE-A- 1 927 032	DE-C- 3 926 894
GB-A- 2 036 631	US-A- 2 574 317
US-A- 3 589 005	US-A- 4 797 997

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 0 618 853 B1

Description

The present invention relates to dry-shaving apparatus comprising a drive provided in a housing and at least two parallel shaving units each consisting of a respective outer cutter, a respective inner cutter and at least one biasing element against which the shaving unit is retractable.

Such apparatus is described in GB-A-2 036 631. GB-A-2 036 631 discloses a dry shaver having two independent shaving units surrounding by a removable shear head frame, each removable separately from the shaver. Each unit has its own outer foil fastened to a base plate, inner cutter and bias spring mounted on the base plate and pressing inner cutter against foil. Moreover, each unit is coupled to the shaver housing by spring-loaded retainers providing respective float springs in the shaver body to enable independent floating movement of both units relative to the shaver body. Neither shaving unit is constructed as a long hair cutter.

Other examples of dry shaving apparatus are known from US-A-4 797 997 and DE-C-3 926 894.

In DE-C-3 926 894 each outer cutter is secured on a shaving head frame arranged on the housing. The inner cutters are mounted on a common coupling element which is connected to a drive element of an electrical drive. Each inner cutter is pressed against the associated outer cutter by means of a respective spring element. The two spring elements each have an appropriate characteristic in order to ensure good engagement of the inner cutter with the outer cutter. According to a further embodiment the outer cutter is mounted on a removable frame coupled to the shaving head frame, which is pivotably mounted on the housing of the dry-shaving apparatus.

A dry-shaving apparatus having four parallel shaving units is known from US-A-3 589 005. The two outer shaving units, constructed as short hair cutters, each consist of an outer cutter, an inner cutter and a spring element arranged between a drive element and the inner cutter. Between the two outer shaving units are provided two comb-like long hair cutters, each of which consists of a toothed cutting comb and an associated toothed cutting blade, particularly for trimming. For this purpose, these toothed long hair trimmers are mounted for adjustment, both together and also independently of one another, relative to the short hair cutters.

According to the invention apparatus of the type initially defined is characterised in that the biasing element of one shaving unit has a characteristic which differs from the biasing element of a further shaving unit, so that the shaving units retreat by differing amounts during shaving under the effect of the same forces.

Preferably, each inner cutter and each associated biasing element is mounted within the associated shaving unit to be removable as a part of the shaving unit.

In one embodiment, each biasing element acts between the associated cutter and a support on the associated shaving unit.

Conveniently, the drive means comprises a pin which located within a slot in the driven cutter, the slot being elongate in the transverse direction of the cutter to permit relative transverse movement of the drive pin and cutter, so that the drive pin need not follow the transverse movements of the foil, but the cutter can faithfully follow these transverse foil movements. A pin with a bifurcated head, for example, a T-bar head, with one limb of the pin in the transverse slot of a cutter of a twin head shaver, is a particularly attractive possibility. These pin or T-bar drives occupy very little space and so offer good possibilities for a closer approach to debris transparency.

For better understanding of the invention, and to show more clearly how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Fig. 1 is a perspective view, partially disassembled and partially broken away, of dry-shaving apparatus according to a first embodiment of the invention;

Fig. 2 is a cross-sectional view taken through the shaving head of the apparatus of Fig. 1, in a plane perpendicular to the line X-X;

Fig. 3 is a longitudinal sectional view through the shaving head of the apparatus of Fig. 1 in a plane containing the line X-X;

Fig. 4 is a cross-sectional view corresponding to that of Fig. 2 of a second embodiment of shaving apparatus according to the invention;

Fig. 5 is a schematic end view of a dry shaver in accordance with another embodiment of the invention;

Fig. 6 shows the same view as Fig. 5, but with the shaving units displaced from their resting disposition, to a position in which one is above and the other is below the resting disposition;

Fig. 7 is a vertical section which includes the longitudinal axis of one of the shaving foils of Fig. 5 with the inner cutter shown in a central position;

Fig. 8 is a vertical section corresponding to that of Fig. 7, but with the inner cutter shown in a displaced position;

Fig. 9a is a transverse cross-section corresponding to Fig. 5 showing more internal detail of the spring biasing system;

Fig. 9b is a transverse cross-section corresponding to Fig. 5 showing more internal detail of the drive mechanism of the shaving head;

Fig. 10 is an exploded view of a further embodiment of shaving apparatus according to the invention;

Fig. 11 is an exploded transverse sectional view of the apparatus of Fig. 10;

Fig. 12 is a transverse sectional view through the triple headed shaving apparatus of Figs. 10 and 11;

Fig. 13 is a transverse sectional view corresponding to Fig. 12 but with an alternative long hair cutter construction;

Fig. 14 is a longitudinal sectional view through the long hair cutter of the embodiment of Fig. 10;

Fig. 15 is a longitudinal vertical section through one of the short hair cutters of the embodiment of Fig. 10;

Fig. 16 is an exploded perspective view of triple headed dry shaver apparatus according to another embodiment of the invention;

Fig. 17 is an exploded transverse sectional view of the triple headed dry shaver apparatus of Fig. 16;

Fig. 18 is a transverse sectional view of the triple headed dry shaver apparatus of Fig. 16, also showing an enlarged view of the long hair cutters;

Fig. 19 is a transverse sectional view corresponding to Fig. 18 showing an enlarged view of an alternative long hair cutter construction;

Fig. 20 is a longitudinal sectional view of the construction of short hair cutter in Fig. 16;

Fig. 21 is a longitudinal sectional view of a long hair cutter construction for the apparatus of Fig. 18;

Fig. 22 is a longitudinal sectional view of a further embodiment of long hair cutter for the apparatus of Fig. 19;

Fig. 23 is a transverse section of a further embodiment of the invention;

Fig. 24 is a perspective view of the upper part of the dry shaver apparatus, in the assembled condition according to the embodiment of Fig. 1, Fig. 10 or Fig. 16, with the rockable head in its central position;

Fig. 25 is a perspective view corresponding to Fig. 24, but with the rockable head in a tilted position;

Fig. 26, comprising individual Figs. 26(a), 26(b) and 26(c), is a schematic diagram of a pivot mechanism for use in the embodiment of Fig. 23;

Fig. 27, Fig. 28 and Fig. 29 are side views of the construction of Figs. 24 and 25 with one end plate removed to show the internal pivot mechanism in first, second and third positions;

Fig. 30 is a front elevation of the apparatus of Figs. 27 to 29; and

Fig. 31 is a perspective view of an example of under-cutter suitable for use in the embodiments of Figs. 1 to 30.

Fig. 1 shows the upper part of a dry-shaver having a housing 1, an on-off switch 2, a beard trimmer 3 having cutting teeth, an upper housing surface 4, a drive pin 6 protruding from an opening 5 in the upper housing surface 4, support arms 9 and 10 extending from respective narrow housing sides 7 and 8, and a shaving head RK mounted for rocking about an axis X-X by means of bearing pins 11 receivable in bearing holes 12 in the carrier arms 9 and 10.

In the shaver head RK, three mutually parallel shaving units 13, 14 and 15 are provided, of which the two outer shaving units 13 and 14 are constructed as short hair cutters and the intermediate shaving unit 15 is constructed as a long hair cutter. The outer cutters 16 and 17 of the short hair cutter units 13, 14 are secured on a frame 19 which is removable from the shaving head from 18. The outer cutter 20 of the shaving unit 15 is mounted for movement relative to the outer cutters 16 and 17 in the removable frame 19.

Further details of the shaving head RK are illustrated in Figs. 2 and 3 and are described in more detail in the following. Fig. 2 shows a cross-section through the upper part of housing 1 and the rockable shaving head RK. Two inner cutters 21 and 22 of the short hair shaving units 13 and 14 contact respective outer cutters 16 and 17 mounted in arched form in the frame 19, the outer cutters 16 and 17 preferably being constructed as shaving foils. The coupling element 23 consists of a base plate 24 with three integrally formed cup-shaped receptacles 25, 26 and 27 and cooperating cup-shaped covers 28, 29 and 30 as well as respective guide pins 42, 43 and 44 provided inside respective receptacles 25, 26, 27 and associated covers 28, 29 and 30, and including compression springs 31, 32, 33 surrounding respective pins. In order to ensure vertical guidance of the inner cutters 21, 22, 34, coupled to the respective covers 28, 29, 30, against the pressure of the respective springs 31, 32, 33, slide bores 35, 36, 37 are formed in the respective covers for receiving pins 42, 43 and 44 respectively. The inner cutters 21 and 22 are pivotably mounted on the upper ends of the receptacle covers 28, 29 by respective coupling elements 38, 39.

The coupling element 23 is coupled by means of the guide pin 44 with a drive element 40, consisting of an oscillating bridge - see Fig. 3. Facing the housing, the drive element 40 has a slot 41, in which engages the

drive pin 6 to accommodate an oscillating movement and also a rocking movement of the head RK.

The shaving unit 15 constructed as a long hair cutter and, consisting of the outer cutter 20, the inner cutter 34, a spring 45 and a coupling element 46, and is operatively coupled to the receptacle cover 30 and thus to the coupling element 23. Further details of the construction and arrangement of the shaving unit 15 are illustrated in Fig. 3 and will be described in more detail in the following, retaining the previously employed reference signs.

On the respective ends of the outer cutter 20, the cutter is provided with guide elements 47, 48, and is movably mounted via these in guide grooves 51, 52 formed in the inner walls 49, 50 of the removable frame 19. On the guide elements 47, 48 are provided bearing arms 53, 54 extending towards the coupling element 46 as a counter-bearing for a spring 45, lying on the coupling element 46. The coupling element 46 and the spring 45 as well as the inner cutter 34 are rigidly connected together. As a consequence, the inner cutter 34 is pressed, by means of the spring 45 engaging with the bearing arms 53, 54, against the outer cutter 20. The spring 33 arranged in the coupling element 23 serves to accommodate the relative motion of the shaving unit 15 constructed as a long hair cutter, relative to the shaving units 13 and 14 constructed as short hair cutters - see Fig. 2 - in response to a force externally applied to the shaving units. As a result of the relative motion of the shaving unit 15 relative to the shaving units 13, 14 good engagement of all shaving units with the skin is achieved, the previously usual actuation of the sharp-edged long hair cutter 3 required for trimming - see Fig. 1 - being avoided for cutting long hairs in the course of shaving as a result of the differing construction of the shaving units as short hair cutter and long hair cutter.

The spring 33 provided for permitting the relative motion of the shaving unit 15 can according to a further embodiment - not illustrated - be arranged to engage at both ends of the shaving head 15 between on the one hand a wall of the shaving head frame 18 and on the other hand the guide elements 47, 48.

Fig. 4 shows a further embodiment of a dry shaver having a long hair cutter 15 movable relative to the short hair cutter shaving units 13, 14. On the housing 1 is mounted a shaving head frame 60 which is removably connected to the housing 1. The drive pin 6 transmitting oscillatory motion is coupled via a guide pin 44 directly with the coupling element 23. The arrangement and construction of the inner cutters 21, 22 as well as the shaving unit 15 constructed as a long hair cutter on the coupling element 23 corresponds to the embodiment according to Figs. 2 and 3.

The outer cutters 16 and 17 of the shaving units 13, 14 are secured on the shaving head frame 60. The short hair cutter shaving unit 15 corresponds in its construction to the embodiments illustrated in Fig. 3 and is coupled via the coupling element 46 to the spring assembly 30. Deviating from the embodiment according to Fig. 3, the respective ends of the shaving unit 15 are movably

mounted by means of the guide elements 47, 48 in guide grooves - not illustrated - formed in the inner walls 49 of the shaving head frame 60.

Referring now to Fig. 5, a shaver head RK includes a first shaving unit 13 and a second shaving unit 14. Each of these units is supported at each end by a depending link, (part of the frame) and each of these four links is carried on an upper transverse rocker link 131 and a lower such link 141. In Fig. 5 the upper link 131 and lower link 141 are visible at one end of the head RK. Each of the rocker links is connected to respective shaving units 13 and 14 by a respective pair of living hinges 150, 151 or 152, 153. The housing body of the shaver provides pivot members 160, 161 on which the rocker links 131, 141 are pivotably mounted. This assembly allows the shaving units to move up and down in response to externally applied force.

Turning now to Fig. 6, it is apparent that rotation of the rocker links 131, 141 causes some transverse displacement of the shaving units 13, 14, simultaneous with the rise and fall of the units 13, 14. This is of course because, for one of the two shaver units (in the case of Fig. 6, the right hand unit 14) the points of hinged attachment to the rocker links 131, 141 rotate to a position further away than the at-rest position from the plane P which includes the rotational axis of both of the links 131, 141. For the other shaving unit 13, of course, this same rotation of the rocker links 131, 141 brings the shaver head closer to the plane P through the rotational axes of the rocker links 131, 141.

Each shaving unit of Figs. 5 and 6 comprises an inner cutter, an outer cutter (preferably a foil) and at least one spring element. Figs. 7, 8, 9a, and 9b show how each inner cutter 21, 22 is mounted and driven. The inner cutter 21 is pressed against the inside of an arched shaving foil 16. The foil 16 is in fact carried on a structural element which includes a first end plate 210 and a second end plate 220 at opposite ends of the foil 16. The shaver head is completed by a common housing or shell which supports the pivotal movement of the four rocker links 131, 141 and also serves to attach the shaver head to the shaver body.

The cutter 21 is urged into contact with the surrounding foil by first and second spring biasing elements 230, 240. Each of these elements has a hollow cup base 250 and slightly larger domed cap 260 which is able to move telescopically up and down on the cup 250 guided by a pin 271. A helical spring 270 in the hollow interior of the element 230 urges the cup 250 and cap 260 apart. A detent 280 around the respective lips of the cup 230 and cap 260 prevents these two components from separating, whilst an eye 290 on the top of the cap 260 receives a pin 300 by which the biasing element 230 is connected at its upper end to the cutter 21. As best shown in Fig 9a at the lower end 310 of each biasing element 230, 240 are provided two laterally projecting trunnion pins 311, 312 which rest on respective corresponding support surfaces 91, 92 cantilevered out from the adjacent frame.

The cutter 21 has a multiplicity of parallel metal cutting blades 400. All of these blades extend outwardly from a backing portion 410 of the cutter. A slot 420 extends transversely to the length of the cutter 21 in a drive-receiving element 430 which is fastened to the backing portion 410 by a pair of rivets 440. A drive pin 6 which extends upwardly from the top of the shaver body (not shown) has an upper end 460 which is received within the slot 420, in order to impart oscillatory motion to cutter 21.

As the cutter 21 executes its oscillatory movement, each of the two biasing devices 230, 240 rocks on its pivot pin 300 and support surface 90, 91, with the spring 270 urging the cap 260 and cutter 21 upwardly, but even when the cutter is at the furthest extent of its lateral movement with the biasing devices 230, 240 fully inclined to the vertical at their maximum angle, as shown in Fig. 8, the detent surfaces 280 remain out of contact, so that the biasing force provided by the spring 270 is still effective.

It will be appreciated that the pin and transverse slot arrangement allows the cutter 21 to move transversely, as has been described above with reference to Figs. 5 and 6, whether or not the drive pin 6 also moves sideways. In fact, there is no need for the drive pin 6 to have any capacity at all for sideways movement. Moreover, the pin 6 engages with slot 420 over sufficient length to prevent disengagement during the rocking movement of the shaving units described with reference to Figs. 5 and 6.

Avoidance of any requirement for the drive pin 6 to move either sideways or up and down helps to simplify the construction of the drive train.

An important advantage of the cap and cup telescopic arrangement for the biasing elements 230, 240 is that their operation is less likely to be adversely affected by debris if the cap and cup are effective to prevent debris from fouling the turns of the spring 270 which provides the biasing force.

It can be seen from Fig. 7 how open the base of each shaver unit 13, 14 can be made. The cutter 21 itself is open over its base area, as is described in more detail hereinafter, particularly with reference to Fig. 31.

In Fig. 9b, the drive pin 6 has an upper end 460 which is bifurcated, to provide a first drive peg 500 which is received within a slot 420 of the shaving unit 13 and a second drive peg 520 which is received within a corresponding slot of the shaving unit 14. In Fig. 9b, the unit 14 is at its limit of upward movement, and so of course unit 13 is at the limit of its downward movement. In consequence, the peg 500 is at the top of the slot 420 and the peg 520 is near the lower open end of its slot. Furthermore, because shaving unit 13 is closer to the pivotal axis of the rocking links 131, 141 than when in its rest position, and shaving unit 14 is further away than when in its rest position, the drive peg 500 goes through and beyond the slot 420, whereas the peg 520 does not extend all the way through its slot. This demonstrates how one drive bar 460 can accommodate all the vertical

and horizontal movements of the units 13, 14 which occur in normal operation of the shaver.

Fig. 10 is an exploded view of a further embodiment of dry-shaving apparatus having three shaving units, including two short hair cutters 13 and 14 and a long hair cutter 15 positioned between the short hair cutters. The long hair cutter 15 is mounted for movement relative to short hair cutters 13 and 14 under forces applied during shaving.

In this embodiment, the outer cutter of the long hair cutter is in the form of a shaving foil 20 with transverse slots. The under cutter 34 takes the form of a comb-like bar which oscillates longitudinally beneath the foil 20. The undercutters 21 and 22 for the short hair cutters take the form of arcuate slotted members of the form generally as shown in Fig. 31.

All three undercutters 21, 22 and 34 are mounted on a sub-assembly 40 acting as a drive element for the undercutters, i.e. acting to transmit the drive from the base of the rockable shaving head RK to the undercutters.

The sub-assembly 40 consists of an upper cover member 30, which is rivetted to the central undercutter 34, a coupling element or fulcrum 301 on which the undercutter 34 pivots when assembled, a pressure spring 33 for biasing the undercutter against the outer foil 20 and a base plate 24 providing three cup-like receptacles 25, 26 and 27 carrying respective drive pins 42, 43 and 44. Coupling element 301 is slidably engaged with drive pin 44 and biased by the spring 33. Further springs 31 and 32 are provided in receptacles 25 and 26, as best shown in Fig. 11. Cover member 30 has two lateral apertures 302 which engage loosely over lateral lugs 303 on receptacle 27.

The lower end of pin 44 protrudes from the sub-assembly 40 and engages in and is retained by a hole 5 in the base surface of the rockable shaving head RK. The hole 5 is surrounded by an annular elastomeric seal member 5a to prevent the ingress of dust or shaving debris.

Referring to Fig. 11, which is a transverse exploded sectional view through the shaving head, it may be seen how the outer cup-like receptacles 25 and 26 are enclosed by respective covers 28 and 29, which also provide slide bores for receiving the drive pins 42 and 43.

Fig. 12 shows the components of Fig. 11 in an assembled condition. The Figure also shows an enlarged view of the form of outer cutter for the central long hair cutter 15.

Fig. 13 is a view similar to that of Fig. 12 but with an alternative form of inner cutter for the central long hair cutter. In this embodiment, the inner cutter has a U-shaped cross-section and is similar to the undercutter described hereinafter with reference to Figs. 16, 17 and 18.

Fig. 14 shows a longitudinal vertical section through the central long hair cutter 15 of Fig. 12. The Figure shows particularly the way in which the undercutter 34 to which the cap member 30 is riveted, rests on the cou-

pling member 301 in a manner to permit rocking movement about a longitudinal or transverse axis. Fig. 14 also shows how the outer cutter 20 is mounted for vertical movement by means of a pin and slot arrangement 120 at each end to enable vertical floating motion of the central long hair cutter against the bias of the spring 33. The characteristics of spring 33 are set relative to those of springs 31 and 32 such that the vertical floating motion of the long hair cutter 15 will occur in use under the influence of normal shaving forces applied as the shaver glides over the skin.

Fig. 15 is a longitudinal vertical section through the short hair cutter 16 of Fig. 12. The undercutter 21 is pivotally secured to the cover member 28 which is interengaged with the cup member 25 forming a part of the base plate 24. The pin 42 is mounted in a bore in the member 25 and is able to slide in a slide bore in the cover member 28, which can move against the bias of spring 31. The spring 31 thus functions to push the undercutter 21 into shaving contact with the outer foil 16.

Fig. 16 shows an isometric exploded view of a further embodiment of dry shaver apparatus according to the invention, in which a central long-hair cutter 15 is mounted for floating movement relative to two short hair cutters 13 and 14.

In this embodiment, the individual undercutters 21, 22 and 34 are individually mounted on respective spring assemblies and are separately driven by respective drive pins 6a, 6b and 6c. Drive pins 6b and 6c are integral parts of a drive member 66 through which the central drive pin 6a is inserted.

The whole undercutter assembly is held together and retained in the outer cutter frame by a generally rectangular wire spring 90.

Fig. 16 also shows the individual components supporting the undercutter 34 for the long hair trimmer 15. These components include a flat spring 341 and two inclined guide members 342 and 343 which are riveted to the undercutter 34. The characteristics of the flat spring 341 are adjusted to permit the floating movement during shaving.

Each of the undercutters 21 and 22 for the short hair cutters is supported on the respective spring assembly 40a or 40b. Reference to Fig. 17 shows the internal structure of the spring assemblies 40a and 40b in more detail. Fig. 17 also shows more clearly how the individual components are assembled together and held via the wire spring 90. The assembled position is shown in Fig. 18.

Fig. 19 is a view similar to that of Fig. 18, showing an alternative embodiment of undercutter for the central long hair trimmer 15. In this embodiment, the undercutter corresponds to the form of undercutter described and illustrated in the embodiment of Fig. 10.

Fig. 20 is a vertical sectional view through one of the short hair cutters of Fig. 18. Fig. 20 shows particularly clearly the construction of the spring assembly 40a, comprising a cover member 28a, a base member 25a and two internal springs 31a and 31b for providing a biasing

force, biasing the undercutter 21 into shaving contact with the outer cutter 16.

Fig. 21 is a vertical sectional view through the long hair cutter 15 of Fig. 18. The Figure also shows how the drive pin 6a engages between the two guide members 342 and 343 and pushes against the flat spring 341. This provides the necessary biasing force pushing the undercutter 34 into shaving contact with the outer cutter 20.

Fig. 22 shows a vertical sectional view through the long hair cutter 15 of the embodiment of Fig. 19. In this embodiment, the inner cutter 34 is in the form of a comb-like bar similar to the form of undercutter shown in Fig. 10. Again the drive pin 6a engages between two guide members 342 and 343 riveted to the undercutter 34. In this case however the biasing force is provided not by a flat spring, but rather by a spring wire 341a, which has its properties selected to permit the required floating movement during shaving.

Fig. 23 shows an embodiment of shaver having fixed geometry in which the shaving head RK rotates on the shaver body 50 through a conventional pivot (not shown) or using living hinges. By the expression "fixed geometry" is meant that the individual shaving units 13, 14 are intercoupled by being fixed relative to one another in the head RK. The head thus tilts as a whole. Lower curved surfaces 61 are shaped to clear counter surfaces 62 of the shaver body.

The first shaving unit 13 in the head RK has a shaving foil 16 in the form of a relatively shallow arch, and inside this arch is an inner cutter 21. Surfaces of the head RK support the long edges of the foil arch 16 and the lower ends of spring biasing means (not shown) which urge the inner cutter 21 up onto the inside of the arch of the foil 16.

The second shaving unit 14 in the head RK is identical to the first, and has a foil 17 and inner cutter 22. Between the first and second shaving units, and lying parallel to them is a long hair cutting unit 15 which also has a foil 20 and inner cutter 34, but the foil 20 has slots instead of small apertures, for improved catching of long hairs, for cutting by the inner cutter 34. As in other embodiments of the invention, the long hair cutter 15 is mounted for floating movement, against a spring, relative to short hair cutters 13 and 14.

To drive the first cutter 21, a transverse drive slot 62 is provided in a drive yoke 63 mounted mid-way along the length of the cutter 21, and a drive peg 64, upstanding from the body, engages with the slot 62. The flank pieces of the slot 62 are large enough always to flank the drive peg 64 irrespective of the rotational position of the head RK on the shaver body 7. The extreme positions of the drive peg 64 in the slot 62 can be seen in Fig. 23.

The second cutter 22 is driven by a second drive peg 65 in just the same way. The inner cutter 34 of the trimmer unit 15 is driven in a corresponding manner.

Referring now to Figure 24, this shows a perspective view of the working end of dry shaving apparatus incorporating a rockable head RK having three shaving units 13, 14 and 15. In addition, a trimmer 3 is provided on the

front surface of the body 1. Figure 24 shows the rockable head RK in its central position. Figure 25 corresponds to Figure 24 but shows the rockable head RK in a fully tilted position.

Two variations of tilting mechanism by which the rocking action of the head RK is achieved in the embodiment of Fig. 24 and 25 are shown firstly in Fig. 26, and secondly in Fig. 27, 28 and 29. This tilting mechanism may also be employed in the embodiment of Fig. 23.

Fig. 26, comprising individual Figures 26(a), 26(b) and 26(c), may be regarded as a modification of the embodiment of Fig. 23 in the sense that in both Fig. 23 and in Fig. 26 the shaver head is of "fixed geometry" (although movable relative to the shaver body), in that the individual shaving units are fixed in position relative to the shaver head. Whilst in the embodiment of Fig. 23, the pivoting or rocking movement of the shaver head is achieved by means of a conventional pivot or living hinge, in the embodiment of Fig. 26 a parallelogram linkage is employed. In Fig. 26 the shaver head RK is mounted on upper ends of two pairs of vertical side members 71 and 72. (One pair of side members may be provided at each side of the shaver). At each side of the shaver the pair of vertical side members 71 and 72 constitute, in combination with transverse link members 73 and 74, a four bar mounting linkage. Each of links 73 and 74 constitutes a bell crank lever.

The bell crank levers 73 and 74 are pivoted at respective pivot points 77 and 78 to fixed points of the shaver frame (not shown). These fixed points of the shaver frame are located on a central plane 75 of the shaver. Through this construction a virtual pivot centre 76 is produced well above the points of attachment of the vertical side members 71 and 72 to the shaver head RK. In fact, the virtual pivot may be located on, above or below skin level in dependence upon the size of the pivoting triangles or bell crank links 73 and 74. This may be achieved without the need for a physical upper pivot location which is required in the embodiment of Fig. 23.

It will be understood that Fig. 26(a) shows the linkage pivoted towards the right-hand side, Fig. 26(b) shows the linkage in a central position, and Fig. 26(c) shows the linkage pivoted to the left.

In addition to the advantage of free location of the virtual pivot centre, this method of mounting the shaver head provides a single solidly linked foil frame assembly which is capable of supporting a multiplicity of foils, for example three foils as shown in Fig. 23, 24 or 25 or more. In addition, by use of the upper virtual pivot centre, the tendency of the individual foils to pivot during shaving, leading to shaving on the side of the foil, can be eliminated.

Referring now to Fig. 27 to 29, an alternative form of parallelogram linkage is illustrated comprising vertical side member 71 and 72, and two rocking links 73 and 74, in the form of bell crank levers, pivoted on the body at pivot point 77 and 78. Contrary to the method employed in Fig. 26, here the upper ends of the arms 71 and 72 are secured to a link member 79 which in turn is

secured to the side of the rocking head RK. Moreover, all pivot points of the mechanism are achieved by means of living hinges 150 to 155 in a similar manner to that illustrated in Figs. 5 and 6. Clearly Fig. 27 and 29 show the mechanism in the two extremes of the tilting action, whereas Fig. 28 shows the mechanism in its central position.

Fig. 30 shows the apparatus of Figs 27 - 29 in a front elevation. The form of the pivot points 77 and 78 is shown more clearly in this Figure. The Figure also demonstrates that corresponding pivot points 77a and 78a are provided on the other side of the apparatus, together with a corresponding tilting mechanism. Fig. 28 may be regarded as an end view of the apparatus of Fig. 30.

Referring to Fig. 31, an inner cutter 21 has a multiplicity of arcuate bridge cutter elements 400, which define a part cylindrical cutting surface for cooperation with a cutting foil of the shaver on the outwardly convex outer surface of the bridge elements. In fact, the arc of the bridge elements is part-circular, so that the cutter is entirely open from below, to provide a high degree of debris transparency.

All the first ends 82 of the bridge elements 400 are linked together by a first support beam 410 which extends the length of the cutter. A similar support beam 84 links together all the second ends of the bridge elements 400, so that the first and second beams face each other from opposite sides of the bridge of the cutter.

Half-way along the length of each of the beams 410, 84 is mounted a yoke 430 of plastics material, mounted by means of two small plastics rivets 440 which extend through bores in the yoke 430 and through fins 86 which extend for a short distance downwardly from the remainder of the beam 410. Each yoke 430 defines a slot 420 for accommodating the transverse pin of a drive peg.

It is preferred to begin the manufacture of the arched cutters with a flat piece of metal. In one possible manufacturing process, the first step is to press a flat work piece of hardenable steel into the required arcuate shape, and then to form the cutter elements by transverse slitting, by grinding or cutting. The requisite heat treatment process is performed before or after the slitting process, but preferably before.

Thus, following pressing of the metal work piece into an arcuate member, a heat treatment process is performed to harden the steel. Transverse slots are then formed, and the resulting article is ground, using, longitudinal profile grinding, to give the required final dimensions.

Claims

1. Dry-shaving apparatus comprising a drive provided in a housing (1), and at least two parallel shaving units (13, 14, 15), each having a respective outer cutter (16, 17, 20), a respective inner cutter (21, 22, 34) in abutment therewith and at least one biasing element (31, 32, 33), against which the shaving unit (13, 14, 15) is retreatable during shaving, character-

- used in that the biasing element (31, 32) of one shaving unit (13, 14) has a characteristic which differs from the biasing element (33) of a further shaving unit (15), so that the shaving units (13, 14, 15) retreat by differing amounts during shaving under the effect of the same forces. 5
2. Apparatus according to claim 2, wherein each outer cutter (16, 17, 20) is movably mounted in a common shaving head frame (19, 60). 10
 3. Apparatus according to claim 1 or 2, wherein each shaving unit (13, 14, 15) has a biasing element (31, 32, 33, 45) by means of whose spring effect the inner cutter (21, 22, 34) is maintained in engagement with the outer cutter (16, 17, 20). 15
 4. Apparatus according to any preceding claim, wherein only one biasing element (31, 32, 33) is provided in each shaving unit (13, 14, 15). 20
 5. Apparatus according to claim 1, 2 or 3, wherein at least one shaving unit (13, 14, 15) is provided with a first biasing element (33) for accommodating said movement and an additional biasing element (45) to maintain engagement between said cutters. 25
 6. Apparatus according to claim 5 as dependent on claim 2, wherein said at least one shaving unit (15) is resiliently mounted in said shaving head frame (19, 60) by means of the first biasing element (33). 30
 7. Apparatus according to claim 5 as dependent on claim 2, wherein said at least one shaving unit (13, 14, 15) has at least one outer cutter (20) resiliently mounted in said shaving head frame (19, 60) by means of the first biasing element (33). 35
 8. Apparatus according to claim 5, wherein the first biasing element (33) is arranged between a drive element (6) and the inner cutter (34) of said at least one shaving unit (13, 14, 15). 40
 9. Apparatus according to any one of the preceding claims, wherein at least one shaving unit (13, 14, 15) is constructed as a long hair cutter. 45
 10. Apparatus according to claim 9, wherein said long hair cutter is provided between two shaving units (16, 17) constructed as short hair cutters. 50
 11. Apparatus according to claim 10 as dependent on claim 2, wherein the outer cutters (16, 17) of the short hair cutting units as well as the outer cutter (20) and inner cutter (34) of the long hair cutter shaving unit (15) are removably mounted on said shaving head frame (19, 60). 55
 12. Apparatus according to claim 2 or any preceding claim dependent on claim 2, wherein the inner cutters (21, 22, 34) of the shaving units (13, 14, 15) can be coupled via at least one coupling element (23) with the drive (6) and are surrounded by said shaving head frame (19, 60) which can be connected to the housing (1).
 13. Apparatus according to claim 2 or any preceding claim dependent on claim 2, wherein the shaving units (13, 14, 15) are mounted for pivotable motion about an axis (X-X) in said shaving head frame (19, 60) on the housing (1).
 14. Apparatus according to any of the preceding claims wherein each shaving unit is mounted for reciprocatory movement generally parallel to the vertical axis of the shaver body.
 15. Apparatus according to claim 14, wherein two shaving units are mounted for counter-reciprocatory motion.
 16. Apparatus according to claim 15, wherein said shaving units are mounted on opposed limbs of a parallelogram linkage.
 17. Apparatus according to claim 2 or any preceding claim dependent thereon, wherein the outer cutters (16, 17, 20) of the shaving units (13, 14, 15) are removably mounted on the shaving head frame (19, 60).
 18. Apparatus according to claim 2 or any preceding claim dependent thereon, wherein all outer cutters (16, 17, 20) are provided on the shaving head frame (19, 60).
 19. Apparatus according to claim 10 as dependent on claim 2, wherein the outer cutter of the short hair cutting system (16, 17) and the shaving unit (15) constructed as a long hair cutter, consisting of outer cutter (20), inner cutter (34), biasing element (45) and a coupling element (46) are provided on said shaving head frame (19, 60).
 20. Apparatus according to claim 10 wherein the relatively movable shaving unit (15) constructed as a long hair cutter, consisting of outer cutter (20), inner cutter (34) and at least one biasing element (45) is coupled by means of a coupling element (46) to a further coupling element (23), in which is provided at least one biasing element (33) for allowing the relative motion.
 21. Apparatus according to claim 20 as dependent on claim 2, wherein the two ends of the shaving unit (15) constructed as a long hair cutter are movably guided in the shaving head frame (19, 60).

22. Apparatus according to claim 10, wherein the relatively movable shaving units (13, 14, 15) constructed as short hair cutter and long hair cutter are arranged on a common coupling element (23) which can be coupled directly or indirectly to the drive pin (6).
23. Apparatus according to claim 10, wherein the inner cutter (34) of the shaving unit (15) constructed as a long hair cutter is surrounded by a U-shaped arcuate outer cutter (20).
24. Apparatus according to any preceding claim, wherein each inner cutter and each associated biasing element is mounted within the associated shaving unit to be removable as a part thereof.
25. Apparatus according to claim 24, wherein each biasing element (230, 240) acts between the associated cutter and a support (90, 91) on the associated shaving unit.
26. Apparatus according to claim 24 or 25, wherein said drive comprises an elongate member (6) arranged to locate within a recess of a cutter.
27. Apparatus according to claim 26, wherein said recess is a slot (420) elongate in the transverse direction of the cutter to permit lateral relative motion of drive member and cutter.
28. Apparatus according to claim 27, wherein said elongate member is a bifurcated pin (460) having respective links (500, 520) engaged in slots of respective cutters.
29. Apparatus according to claim 28, wherein said bifurcated pin has a T-bar head.
30. Apparatus according to any of claims 24 to 29 wherein each shaving unit is mounted for reciprocatory movement generally parallel to the vertical axis of the shaver housing.
31. Apparatus according, to, claim 30, wherein two shaving units are mounted for counter-reciprocatory motion.
32. Apparatus according to claim 31, wherein said shaving units are mounted on opposed limbs of a parallelogram linkage.
33. Apparatus according to any of claims 24 to 29 wherein said shaving units are fixed relative to each other to form a shaver head which is pivotably mounted on the shaver housing.
34. Apparatus according to claim 33 wherein said shaver head is mounted on two opposed limbs of a parallelogram linkage.
35. Apparatus according to claim 32 or 34, wherein said linkage comprises two transverse link members which are pivotably secured to the shaver housing.
36. Apparatus according to claim 35 wherein said transverse link members form bell-crank levers.
37. Apparatus according to any of claims 24 to 36, wherein each cutter has an open base from which extend a plurality of outwardly convex arcuate bridge cutter elements defining a part-cylindrical cutting surface for cooperating in shear with the inner surface of the associated outer cutter.
38. Apparatus according to claim 37, wherein each cutter comprises:
- i) a first support beam, extending lengthwise of the cutter and linking together first ends of respective bridge elements,
 - ii) a second support beam, extending lengthwise of the cutter and linking together second ends of respective bridge elements; and
 - iii) receiving means to receive a reciprocatory drive, said means being located on at least one of the support beams.
39. Apparatus according to claim 38, wherein said receiving means comprises a yoke mounted on at least one beam.
40. Apparatus according to claim 39, wherein the or each yoke is mounted centrally on its beam.
41. Apparatus according to claim 38 or 39, wherein the or each yoke defines an aperture for receiving a drive member.
42. Apparatus according to claim 41, wherein said aperture is an open-ended slot.

Patentansprüche

1. Trockenrasierer mit einem in einem Gehäuse (1) vorgesehenen Antrieb, und mit zumindest zwei parallelen Rasiereinheiten (13, 14, 15), die jeweils eine zugehörige äußere Schervorrichtung (16, 17, 20), eine hieran anliegende zugehörige innere Schervorrichtung (21, 22, 34) und zumindest ein Vorspannelement (31, 32, 33) aufweisen, gegen welches die Rasiereinheit (13, 14, 15) während des Rasiervorgangs rückziehbar ist, dadurch gekennzeichnet, daß das Vorspannelement (31, 32) einer Rasiereinheit (13, 14) eine Charakteristik aufweist, welche sich von jener des Vorspannelementes (33) einer weiteren Rasiereinheit (15) unterscheidet, so daß sich die Rasiereinheiten (13, 14, 15) in unterschied-

lichem Ausmaß beim Rasieren unter Einwirkung derselben Kräfte zurückziehen.

2. Vorrichtung nach Anspruch 1, bei welcher jede äußere Schervorrichtung (16, 17, 20) in einem gemeinsamen Scherkopfgestell (19, 60) beweglich angebracht ist. 5
3. Vorrichtung nach Anspruch 1 oder 2, bei welcher jede Rasiereinheit (13, 14, 15) ein Vorspannelement (31, 32, 33, 45) aufweist, durch dessen Federwirkung die innere Schervorrichtung (21, 22, 34) im Eingriff mit der äußeren Schervorrichtung (16, 17, 20) gehalten wird. 10
4. Vorrichtung nach einem der voranstehenden Ansprüche, bei welcher nur ein Vorspannelement (31, 32, 33) in jeder Rasiereinheit (13, 14, 15) vorgesehen ist. 15
5. Vorrichtung nach Anspruch 1, 2 oder 3, bei welcher zumindest eine Rasiereinheit (13, 14, 15) mit einem ersten Vorspannelement (33) versehen ist, um die Bewegung aufzunehmen, und mit einem zusätzlichen Vorspannelement (45), um den Eingriff zwischen den Schervorrichtungen aufrecht zu erhalten. 20
6. Vorrichtung nach Anspruch 5 in Abhängigkeit vom Anspruch 2, bei welcher die zumindest eine Rasiereinheit (15) federelastisch in dem Scherkopfgestell (19, 60) durch das erste Vorspannelement (33) angebracht ist. 25
7. Vorrichtung nach Anspruch 5 in Abhängigkeit von Anspruch 2, bei welcher die zumindest eine Rasiereinheit (13, 14, 15) zumindest eine äußere Schervorrichtung (20) aufweist, die in dem Scherkopfgestell (19, 60) durch das erste Vorspannelement (33) federelastisch angebracht ist. 30
8. Vorrichtung nach Anspruch 5, bei welcher das erste Vorspannelement (33) zwischen einem Antriebselement (6) und der inneren Schervorrichtung (34) der zumindest einen Rasiereinheit (13, 14, 15) angeordnet ist. 35
9. Vorrichtung nach einem der voranstehenden Ansprüche, bei welcher zumindest eine Rasiereinheit (13, 14, 15) als Langhaarschneider ausgebildet ist. 40
10. Vorrichtung nach Anspruch 9, bei welcher der Langhaarschneider zwischen zwei Rasiereinheiten (16, 17) angeordnet ist, die als Kurzhaarschneider ausgebildet sind. 45
11. Vorrichtung nach Anspruch 10 in Abhängigkeit von Anspruch 2, bei welcher die äußeren Schervorrichtungen (16, 17) der Kurzhaarschneideinheiten und

ebenso die äußere Schervorrichtung (20) und die innere Schervorrichtung (34) der Langhaarschneider-Rasiereinheit (15) abnehmbar auf dem Scherkopfgestell (19, 60) angebracht sind.

12. Vorrichtung nach Anspruch 2 oder nach jedem voranstehenden Anspruch, der von Anspruch 2 abhängig ist, bei welcher die inneren Schervorrichtungen (21, 22, 34) der Rasiereinheiten (13, 14, 15) über zumindest ein Kupplungselement (23) mit dem Antrieb (6) gekuppelt werden können, und von dem Scherkopfgestell (19, 60) umgeben sind, welches mit dem Gehäuse (1) verbunden werden kann. 50
13. Vorrichtung nach Anspruch 2 oder jedem voranstehenden Anspruch, der von Anspruch 2 abhängig ist, bei welcher die Rasiereinheiten (13, 14, 15) schwenkbeweglich um eine Achse (X-X) in dem Scherkopfgestell (19, 60) auf dem Gehäuse (1) angebracht sind. 55
14. Vorrichtung nach einem der voranstehenden Ansprüche, bei welcher jede Rasiereinheit hin- und herbeweglich im wesentlichen parallel zur Vertikalachse des Rasierergehäuses angebracht ist.
15. Vorrichtung nach Anspruch 14, bei welcher zwei Rasiereinheiten in Gegenrichtung hin- und herbeweglich angebracht sind.
16. Vorrichtung nach Anspruch 15, bei welcher die Rasiereinheiten auf entgegengesetzten Schenkeln eines Parallelogrammgestells angebracht sind.
17. Vorrichtung nach Anspruch 2 oder jedem von diesem abhängigen voranstehenden Anspruch, bei welcher die äußeren Schervorrichtungen (16, 17, 20) der Rasiereinheiten (13, 14, 15) abnehmbar auf dem Scherkopfgestell (19, 60) angebracht sind.
18. Vorrichtung nach Anspruch 2 oder jedem voranstehenden, von diesem abhängigen Anspruch, bei welcher sämtliche äußeren Schervorrichtungen (16, 17, 20) auf dem Scherkopfgestell (19, 60) vorgesehen sind.
19. Vorrichtung nach Anspruch 10 in Abhängigkeit von Anspruch 2, bei welcher die äußere Schervorrichtung des Kurzhaarschneidsystems (16, 17) und die als Langhaarschneider aufgebaute Rasiereinheit (15), die aus der äußeren Schervorrichtung (20), der inneren Schervorrichtung (34), dem Vorspannelement (45) und einem Kupplungselement (46) besteht, auf dem Scherkopfgestell (19, 60) vorgesehen sind.
20. Vorrichtung nach Anspruch 10, bei welcher die relativbewegliche Rasiereinheit (15), die als Langhaarschneider ausgebildet ist und aus der äußeren

- Schervorrichtung (20), der inneren Schervorrichtung (34) und zumindest einem Vorspannelement (45) besteht, über ein Kupplungselement (46) an ein weiteres Kupplungselement (23) gekuppelt ist, in welchem zumindest ein Vorspannelement (33) vorgesehen ist, um die Relativbewegung zu ermöglichen.
21. Vorrichtung nach Anspruch 20 in Abhängigkeit vom Anspruch 2, bei welcher die beiden Enden der Rasiereinheit (15), die als Langhaarschneider aufgebaut ist, beweglich in dem Scherkopfgestell (19, 60) geführt sind.
22. Vorrichtung nach Anspruch 10, bei welcher die relativbeweglichen Rasiereinheiten (13, 14, 15), die als Kurzhaarschneider und Langhaarschneider ausgebildet sind, auf einem gemeinsamen Kupplungselement (23) angeordnet sind, welches direkt oder indirekt mit dem Antriebsstift (6) gekuppelt werden kann.
23. Vorrichtung nach Anspruch 10, bei welcher die innere Schervorrichtung (34) der als Langhaarschneider ausgebildeten Rasiereinheit (15) von einer U-förmigen, gebogenen äußeren Schervorrichtung (20) umgeben ist.
24. Vorrichtung nach einem der voranstehenden Ansprüche, bei welcher jede innere Schervorrichtung und jedes zugehörige Vorspannelement innerhalb der zugeordneten Rasiereinheit so angebracht ist, daß sie bzw. es als Teil von dieser entfernbar ist.
25. Vorrichtung nach Anspruch 24, bei welcher jedes Vorspannelement (230, 240) zwischen der zugehörigen Schervorrichtung und einer Halterung (90, 91) auf der zugehörigen Rasiereinheit arbeitet.
26. Vorrichtung nach Anspruch 24 oder 25, bei welcher der Antrieb ein längliches Teil (6) aufweist, welches so angeordnet ist, daß es sich innerhalb einer Ausnehmung einer Schervorrichtung befindet.
27. Vorrichtung nach Anspruch 26, bei welcher die Ausnehmung ein Schlitz (420) ist, der in Querrichtung der Schervorrichtung länglich ausgebildet ist, um eine Querrelativbewegung des Antriebsteils und der Schervorrichtung zu gestatten.
28. Vorrichtung nach Anspruch 27, bei welcher das längliche Teil ein gegabelter Stift (460) ist, der jeweilige Laschen (500, 520) aufweist, die in Schlitzen jeweiliger Schervorrichtungen in Eingriff stehen.
29. Vorrichtung nach Anspruch 28, bei welcher der gegabelte Stift einen Kopf in Form einer T-Stange aufweist.
30. Vorrichtung nach einem der Ansprüche 24 bis 29, bei welcher jede Rasiereinheit hin- und herbeweglich im wesentlichen parallel zur Vertikalachse des Rasierergehäuses angebracht ist.
31. Vorrichtung nach Anspruch 30, bei welcher zwei Rasiereinheiten so angebracht sind, daß sie sich gegenläufig hin- und herbewegen können.
32. Vorrichtung nach Anspruch 31, bei welcher die Rasiereinheiten auf gegenüberliegenden Schenkeln eines Parallelogrammgestänges angebracht sind.
33. Vorrichtung nach einem der Ansprüche 24 bis 29, bei welcher die Rasiereinheiten in bezug aufeinander starr ausgebildet sind, um einen Scherkopf auszubilden, der schwenkbeweglich auf dem Rasierergehäuse angebracht ist.
34. Vorrichtung nach Anspruch 33, bei welcher der Scherkopf auf zwei gegenüberliegenden Schenkeln eines Parallelogrammgestänges angebracht ist.
35. Vorrichtung nach Anspruch 32 oder 34, bei welcher das Gestänge zwei Quer-Laschenteile aufweist, welche drehbeweglich an dem Rasierergehäuse befestigt sind.
36. Vorrichtung nach Anspruch 35, bei welcher die Quer-Laschenteile Winkelhebel bilden.
37. Vorrichtung nach einem der Ansprüche 24 bis 36, bei welcher jede Schervorrichtung eine offene Basis aufweist, von welcher mehrere nach außen konvexe, bogenförmige Brücken-Scherkopfelemente ausgehen, welche eine teilweise zylindrische Scheroberfläche ausbilden, die beim Rasieren mit der Innenoberfläche der zugehörigen äußeren Schervorrichtung zusammenarbeitet.
38. Vorrichtung nach Anspruch 37, bei welcher jede Schervorrichtung aufweist:
- i) einen ersten Halterungsträger, der sich in Längsrichtung der Schervorrichtung erstreckt und erste Enden jeweiliger Brückenelemente miteinander verbindet;
 - ii) einen zweiten Halterungsträger, der sich in Längsrichtung der Schervorrichtung erstreckt und zweite Enden jeweiliger Brückenelemente miteinander verbindet; und
 - iii) eine Aufnahmevorrichtung, zur Aufnahme eines sich hin- und herbewegenden Antriebs, wobei die Vorrichtung auf zumindest einem der Halterungsträger angeordnet ist.

39. Vorrichtung nach Anspruch 38, bei welcher die Aufnahmevorrichtung ein Joch aufweist, welches auf zumindest einem Träger angebracht ist.
40. Vorrichtung nach Anspruch 39, bei welcher das oder jedes Joch im Zentrum seines Trägers angebracht ist. 5
41. Vorrichtung nach Anspruch 38 oder 39, bei welcher das oder jedes Joch eine Öffnung zur Aufnahme eines Antriebsteils ausbildet. 10
42. Vorrichtung nach Anspruch 41, bei welcher die Öffnung ein am Ende offener Schlitz ist. 15

Revendications

1. Appareil de rasage à sec, comprenant un entraînement prévu dans un boîtier (1), et au moins deux unités de rasage parallèles (13, 14, 15), ayant chacune un couteau extérieur respectif (16, 17, 20), et un couteau intérieur respectif (21, 22, 34) en appui contre celui-ci, et au moins un élément de poussée (31, 32, 33), contre lequel l'unité de rasage (13, 14, 15) peut être rétractée pendant le rasage, caractérisé en ce que l'élément de poussée (31, 32) de l'une des unités de rasage (13, 14) a une caractéristique qui diffère de l'élément de poussée (33) d'une autre unité de rasage (15), de sorte que les unités de rasage (13, 14, 15) se rétractent sur des distances différentes pendant le rasage sous l'effet des mêmes forces. 20 25 30
2. Appareil selon la revendication 1, dans lequel chaque couteau extérieur (16, 17, 20) est monté de manière mobile dans un cadre de tête de rasage commun (19, 60). 35
3. Appareil selon l'une ou l'autre des revendications 1 ou 2, dans lequel chaque unité de rasage (13, 14, 15) possède un élément de poussée (31, 32, 33, 45), le couteau intérieur (21, 22, 34) étant maintenu en engagement avec le couteau extérieur (16, 17, 20) au moyen de l'effet de ressort dudit élément de poussée. 40 45
4. Appareil selon l'une quelconque des revendications précédentes, dans lequel on prévoit un seul élément de poussée (31, 32, 33) dans chaque unité de rasage (13, 14, 15). 50
5. Appareil selon l'une des revendications 1, 2 ou 3, dans lequel l'une au moins des unités de rasage (13, 14, 15) est pourvue d'un premier élément de poussée (33) pour permettre ledit mouvement, et d'un élément de poussée additionnel (45) pour maintenir l'engagement entre lesdits couteaux. 55
6. Appareil selon la revendication 5 prise en dépendance de la revendication 2, dans lequel ladite unité de rasage (15) est montée élastiquement dans ledit cadre de tête de rasage (19, 60) au moyen du premier élément de poussée (33).
7. Appareil selon la revendication 5 prise en dépendance de la revendication 2, dans lequel ladite unité de rasage (13, 14, 15) comporte au moins un couteau extérieur (20) monté élastiquement dans ledit cadre de tête de rasage (19, 60) au moyen du premier élément de poussée (33).
8. Appareil selon la revendication 5, dans lequel le premier élément de poussée (33) est agencé entre un élément d'entraînement (6) et le couteau intérieur (34) de ladite unité de rasage (13, 14, 15).
9. Appareil selon l'une quelconque des revendications précédentes, dans laquelle l'une au moins des unités de rasage (13, 14, 15) est construite sous la forme d'un dispositif de coupe pour cheveux longs.
10. Appareil selon la revendication 9, dans lequel ledit dispositif de coupe pour cheveux longs est prévu entre deux unités de rasage (16, 17) construites sous la forme de dispositifs de coupe pour cheveux courts.
11. Appareil selon la revendication 10 prise en dépendance de la revendication 2, dans lequel les couteaux extérieurs (16, 17) des unités de coupe pour cheveux courts, ainsi que le couteau extérieur (20) et le couteau intérieur (34) de l'unité de rasage de coupe pour cheveux longs (15) sont montés de façon amovible sur ledit cadre de tête de rasage (19, 60).
12. Appareil selon la revendication 2, ou selon l'une quelconque des revendications précédentes prise en dépendance de la revendication 2, dans lequel les couteaux intérieurs (21, 22, 34) des unités de rasage (13, 14, 15) peuvent être accouplés via au moins un élément d'accouplement (23) avec l'entraînement (6), et sont entourés par ledit cadre de tête de rasage (19, 60) qui peut être raccordé au boîtier (1).
13. Appareil selon la revendication 2, ou selon l'une quelconque des revendications précédentes prise en dépendance de la revendication 2, dans lequel les unités de rasage (13, 14, 15) sont montées en mouvement de pivotement autour d'un axe (X-X) dans ledit cadre de tête de rasage (19, 60) sur le boîtier (1).
14. Appareil selon l'une quelconque des revendications précédentes, dans lequel chaque unité de rasage est montée en mouvement de va-et-vient générale-

ment parallèlement à l'axe vertical du corps de rasoir.

15. Appareil selon la revendication 14, dans lequel deux unités de rasage sont montées en mouvements de va-et-vient contraires. 5
16. Appareil selon la revendication 15, dans laquelle lesdites unités de rasage sont montées sur des membres opposés d'une tringlerie à parallélogramme. 10
17. Appareil selon la revendication 2, ou selon l'une quelconque des revendications précédentes prise en dépendance de la revendication 2 dans lequel les couteaux extérieurs (16, 17, 20) des unités de rasage (13, 14, 15) sont montés de façon amovible sur le cadre de tête de rasage (19, 60). 15
18. Appareil selon la revendication 2, ou selon l'une quelconque des revendications précédentes prise en dépendance de la revendication 2, dans lequel tous les couteaux extérieurs (16, 17, 20) sont prévus sur le cadre de tête de rasage (19, 60). 20
19. Appareil selon la revendication 10, prise en dépendance de la revendication 2, dans lequel le couteau extérieur du dispositif de coupe pour cheveux courts (16, 17) et l'unité de rasage (15) construite sous la forme d'un dispositif de coupe pour cheveux longs, comprenant un couteau extérieur (20), un couteau intérieur (34), un élément de poussée (45), et un élément d'accouplement (46), sont prévus sur ledit cadre de tête de rasage (19, 60). 25 30
20. Appareil selon la revendication 10, dans lequel l'unité de rasage (15) relativement mobile et construite sous la forme d'un dispositif de coupe pour cheveux longs, constituée d'un couteau extérieur (20), d'un couteau intérieur (34) et d'au moins un élément de poussée (45), est accouplée au moyen d'un élément d'accouplement (46) à un autre élément d'accouplement (23), dans lequel est prévu au moins un élément de poussée (33) pour permettre le mouvement relatif. 35 40
21. Appareil selon la revendication 20 prise en dépendance de la revendication 2, dans lequel les deux extrémités de l'unité de rasage (15) construite sous la forme d'un dispositif de coupe pour cheveux longs, sont guidées en déplacement dans le cadre de tête de rasage (19, 60). 50
22. Appareil selon la revendication 10, dans lequel les unités de rasage relativement mobiles (13, 14, 15) construites sous la forme de dispositifs de coupe pour cheveux courts et de dispositifs de coupe pour cheveux longs, sont agencées sur un élément d'accouplement commun (23) qui peut être accou-

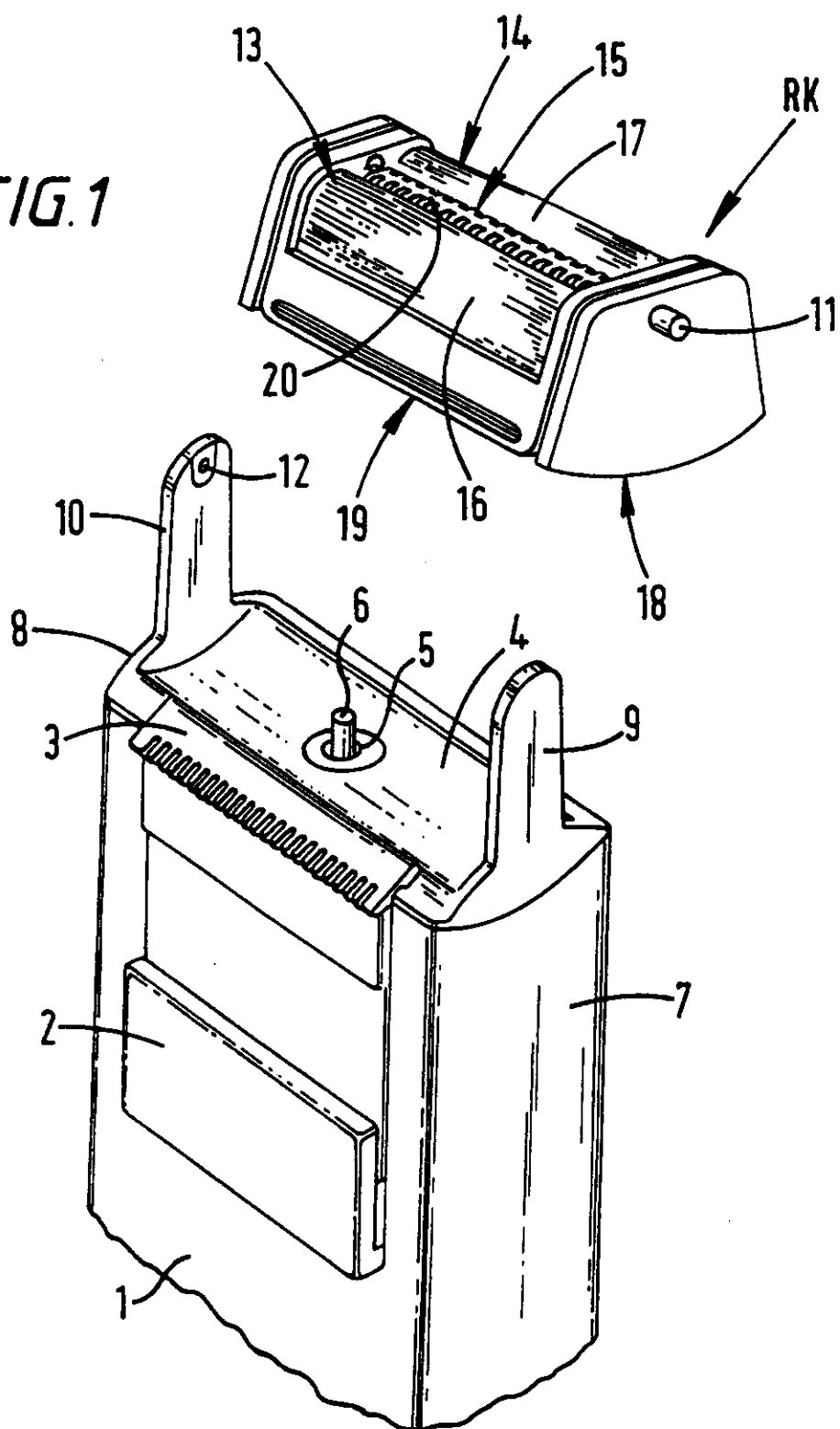
plé directement ou indirectement à la tige d'entraînement (6).

23. Appareil selon la revendication 10, dans lequel le couteau intérieur (34) de l'unité de rasage (15) construite sous la forme d'un dispositif de coupe pour cheveux longs est entouré par un couteau extérieur cintré en forme de U (20).
24. Appareil selon l'une quelconque des revendications précédentes, dans lequel chaque couteau intérieur et chaque élément de poussée associé est monté dans l'unité de rasage associée de manière à être amovible en tant que partie de celle-ci.
25. Appareil selon la revendication 24, dans lequel chaque élément de poussée (230, 240) agit entre le couteau associé et un support (90, 91) sur l'unité de rasage associée.
26. Appareil selon l'une ou l'autre des revendications 24 et 25, dans lequel ledit entraînement comprend un élément allongé (6) agencé de manière à se placer dans un évidement d'un couteau.
27. Appareil selon la revendication 26, dans lequel ledit évidement est une fente (420) allongée dans la direction transversale du couteau, pour permettre un mouvement relatif latéral de l'élément d'entraînement et du couteau.
28. Appareil selon la revendication 27, dans lequel ledit élément allongé est une tige fourchue (460) ayant des bras respectifs (500, 520) engagés dans des fentes des couteaux respectifs.
29. Appareil selon la revendication 28, dans lequel ladite tige fourchue possède une tête en forme de T.
30. Appareil selon l'une quelconque des revendications 24 à 29, dans lequel chaque unité de rasage est montée en mouvement de va-et-vient généralement parallèlement à l'axe vertical du boîtier de rasoir.
31. Appareil selon la revendication 30, dans lequel deux unités de rasage sont montées en mouvements de va-et-vient contraires. 45
32. Appareil selon la revendication 31, dans lequel lesdites unités de rasage sont montées sur des bras opposés d'une tringlerie à parallélogramme. 50
33. Appareil selon l'une quelconque des revendications 24 à 29, dans laquelle lesdites unités de rasage sont fixées l'une par rapport à l'autre pour former une tête de rasage qui est montée en pivotement sur le boîtier de rasoir.

34. Appareil selon la revendication 33, dans lequel ladite tête de rasage est montée sur deux bras opposés d'une tringlerie à parallélogramme.
35. Appareil selon l'une ou l'autre des revendications 32 et 34, dans lequel ladite tringlerie comprend deux bras transversaux qui sont attachés en pivotement sur le boîtier de rasoir. 5
36. Appareil selon la revendication 35, dans lequel les bras transversaux forment des leviers coudés. 10
37. Appareil selon l'une quelconque des revendications 24 à 36, dans lequel chaque couteau comporte une base ouverte depuis laquelle s'étendent une pluralité d'éléments de couteau en forme de pontets cintrés de manière convexe vers l'extérieur, définissant une surface de coupe partiellement cylindrique, pour coopérer en cisaillement avec la surface intérieure du couteau extérieur associé. 15
20
38. Appareil selon la revendication 37, dans lequel chaque couteau comprend :
- i) une première poutre de support, qui s'étend le long du couteau et qui relie ensemble des premières extrémités des éléments de pontets respectifs; 25
 - ii) une seconde poutre de support, qui s'étend le long du couteau et qui relie ensemble des secondes extrémités des éléments de pontets respectifs ; et 30
 - iii) des moyens de réception pour recevoir un entraînement en va-et-vient, lesdits moyens étant placés sur l'une au moins des poutres de support. 35
39. Appareil selon la revendication 38, dans lequel lesdits moyens de réception comprennent un étrier monté sur au moins une poutre. 40
40. Appareil selon la revendication 39, dans lequel chaque étrier est monté en position centrale sur sa poutre. 45
41. Appareil selon l'une ou l'autre des revendications 38 et 39, dans lequel chaque étrier définit une ouverture pour recevoir un élément d'entraînement.
42. Appareil selon la revendication 41, dans lequel ladite ouverture est une fente ouverte à l'extrémité. 50

55

FIG. 1



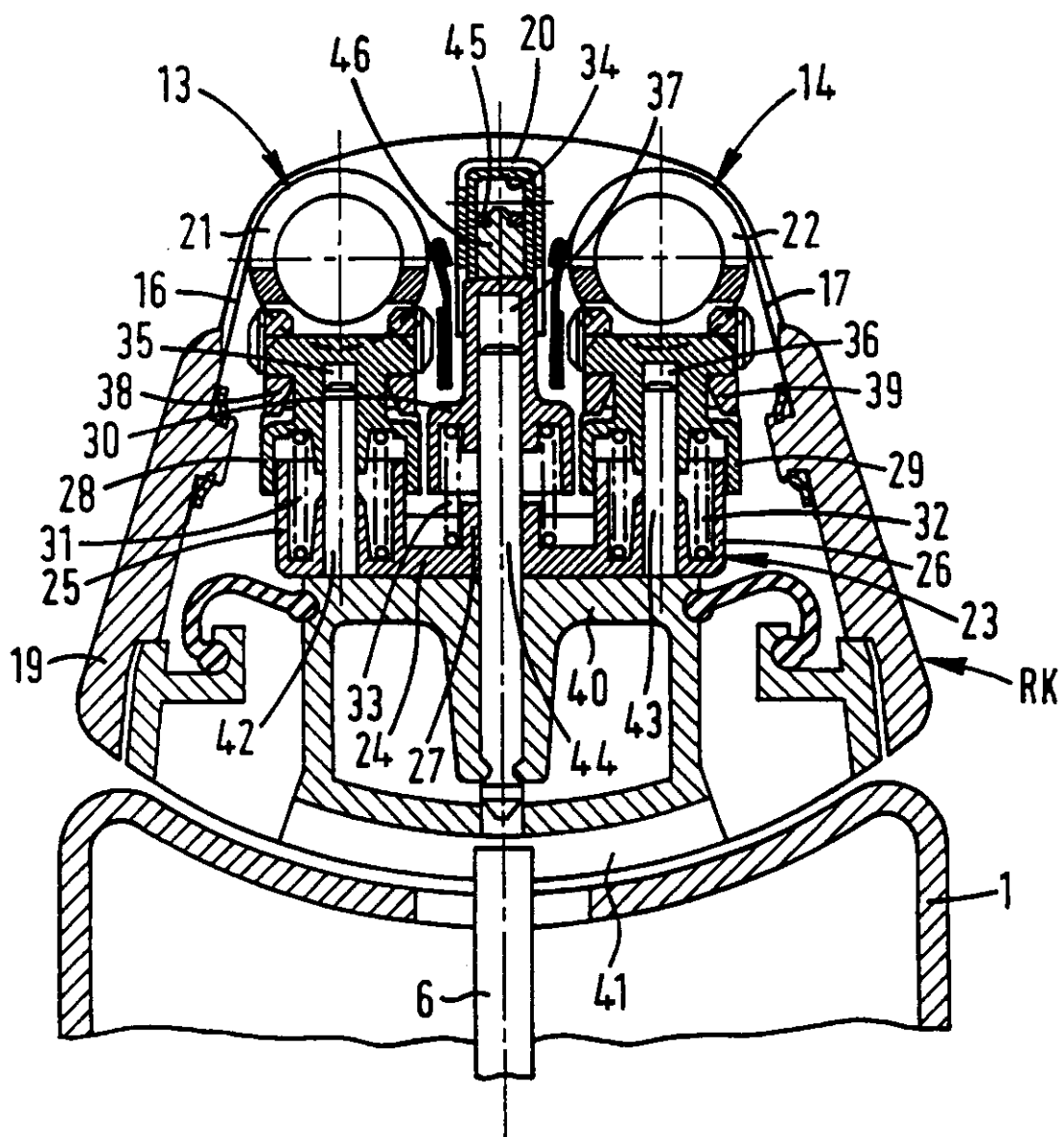


FIG. 2

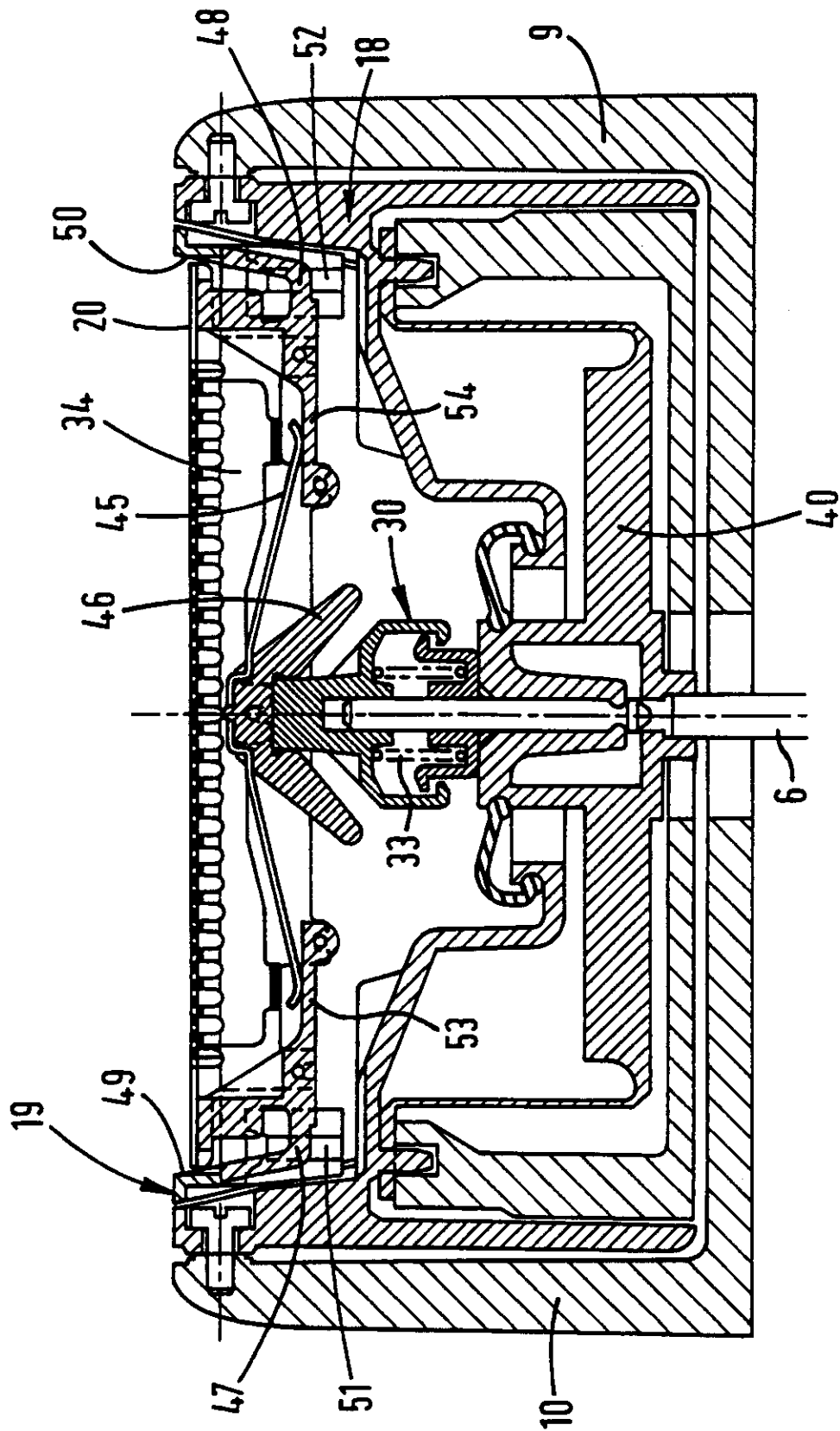


FIG. 3

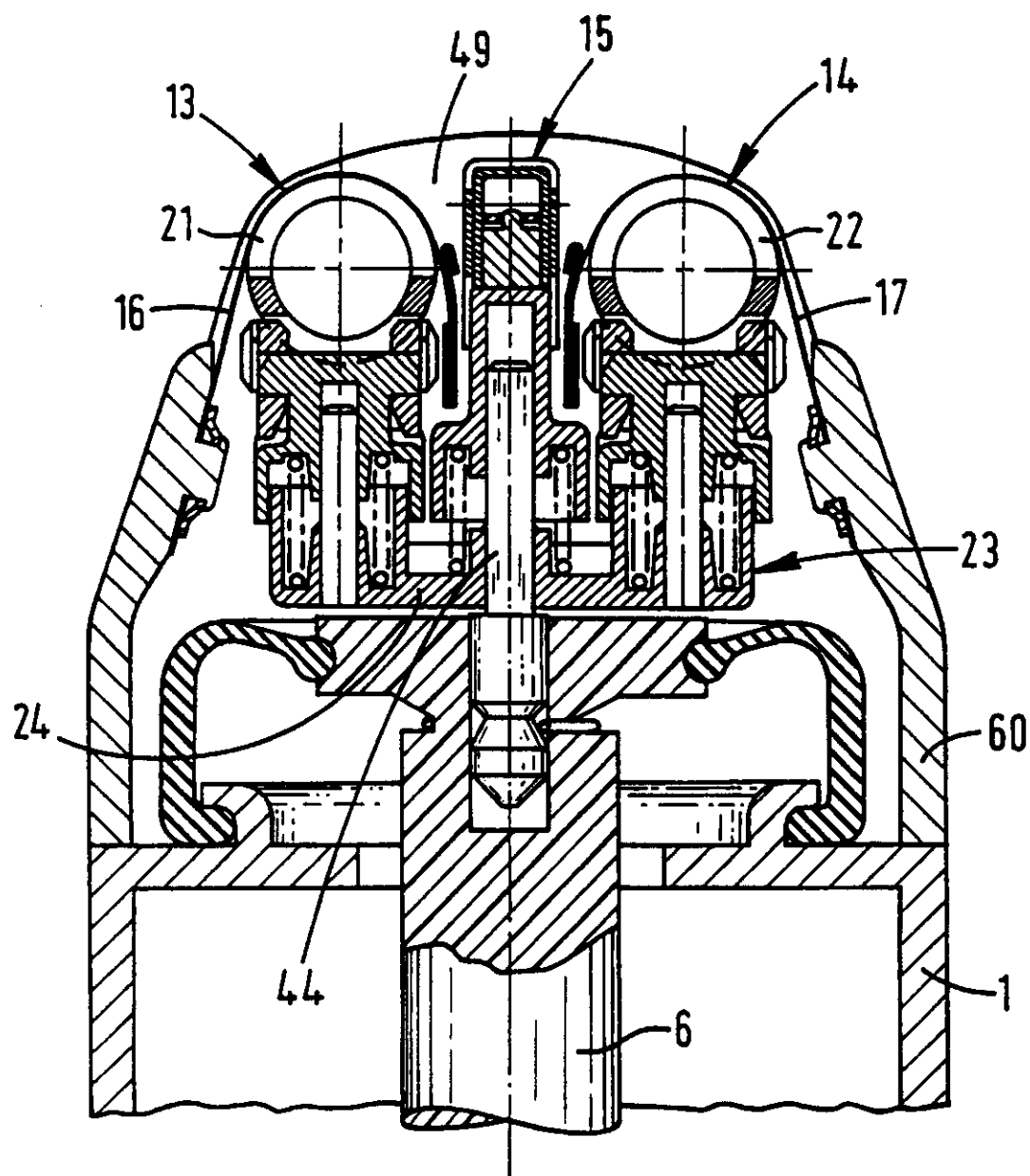


FIG.4

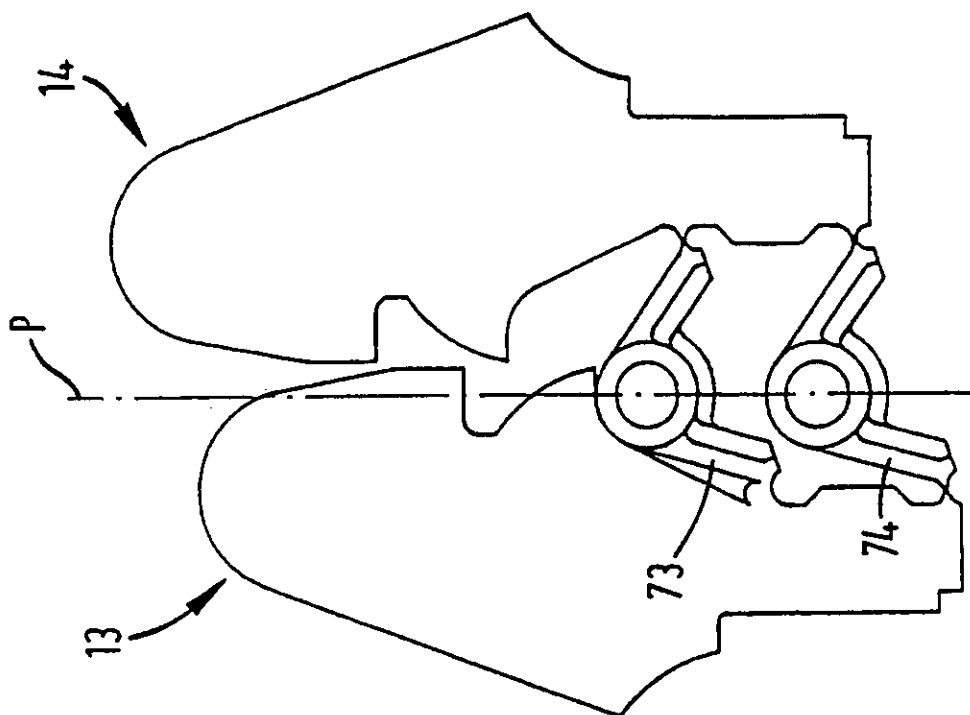


FIG. 6

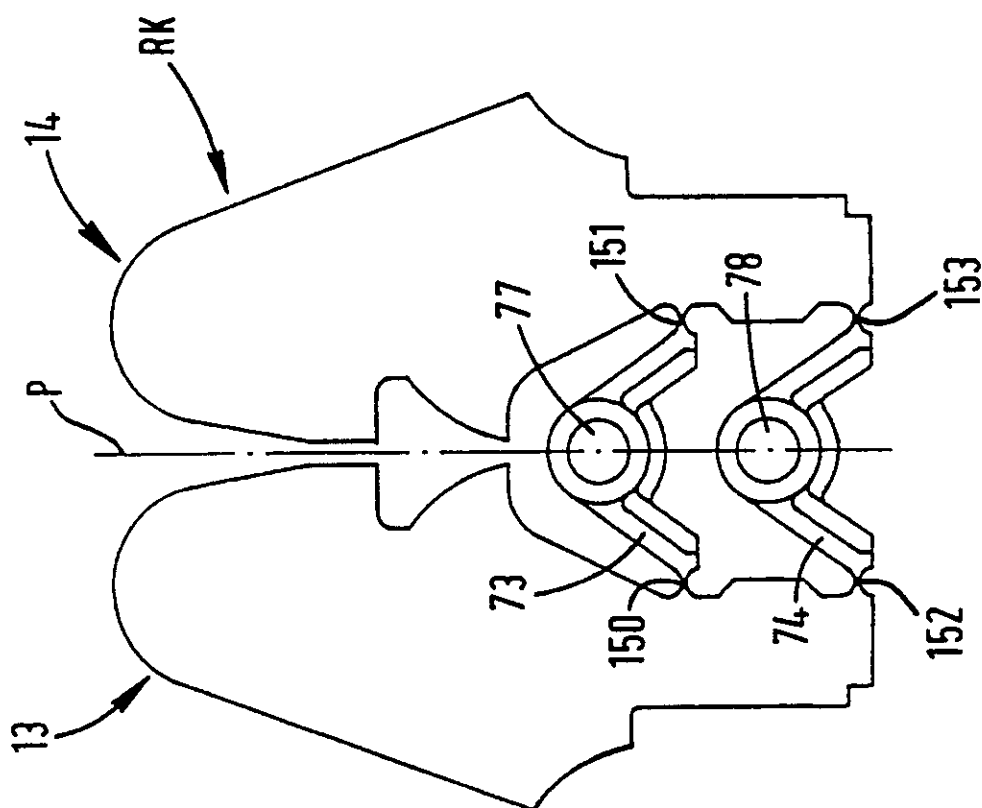


FIG. 5

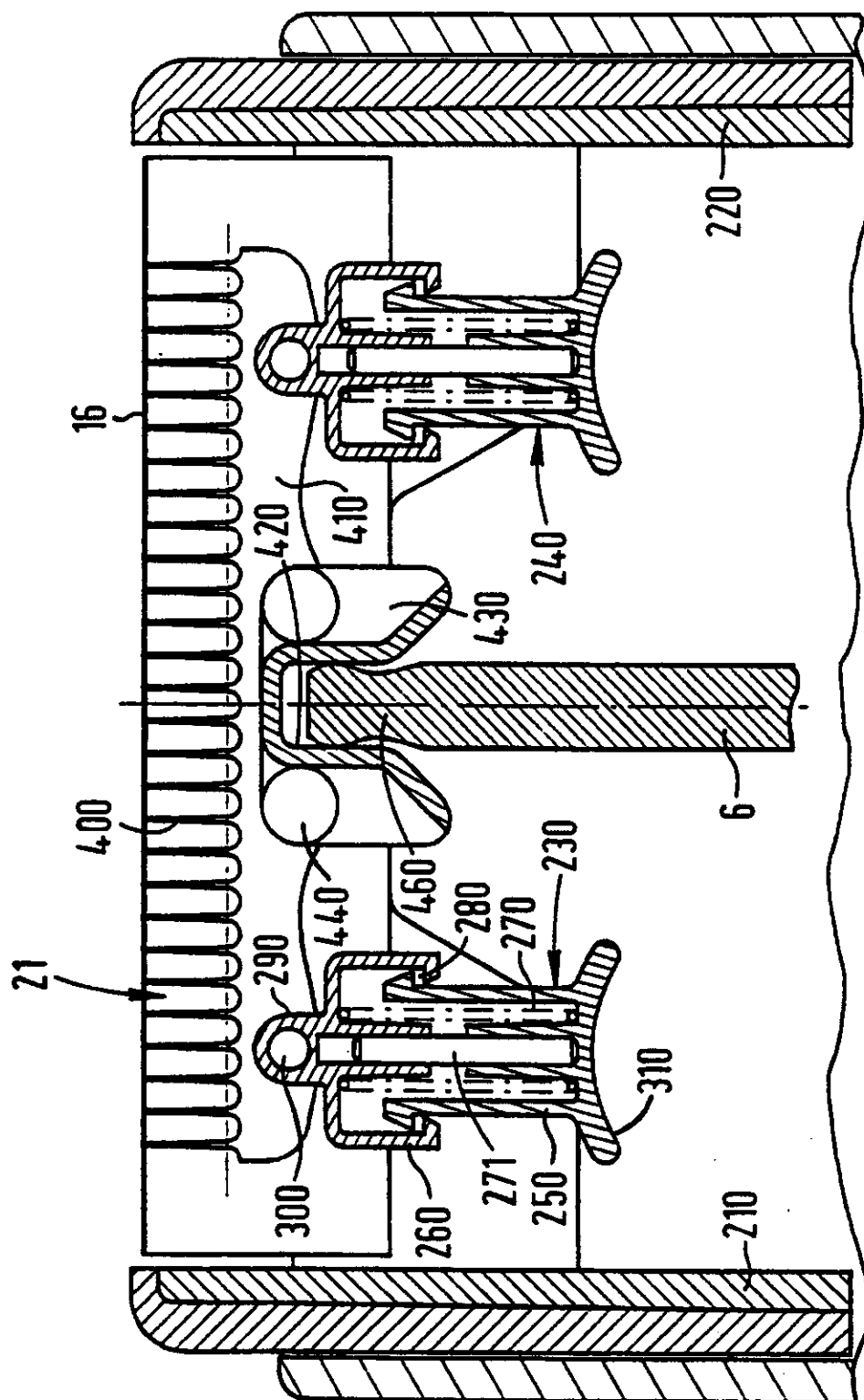
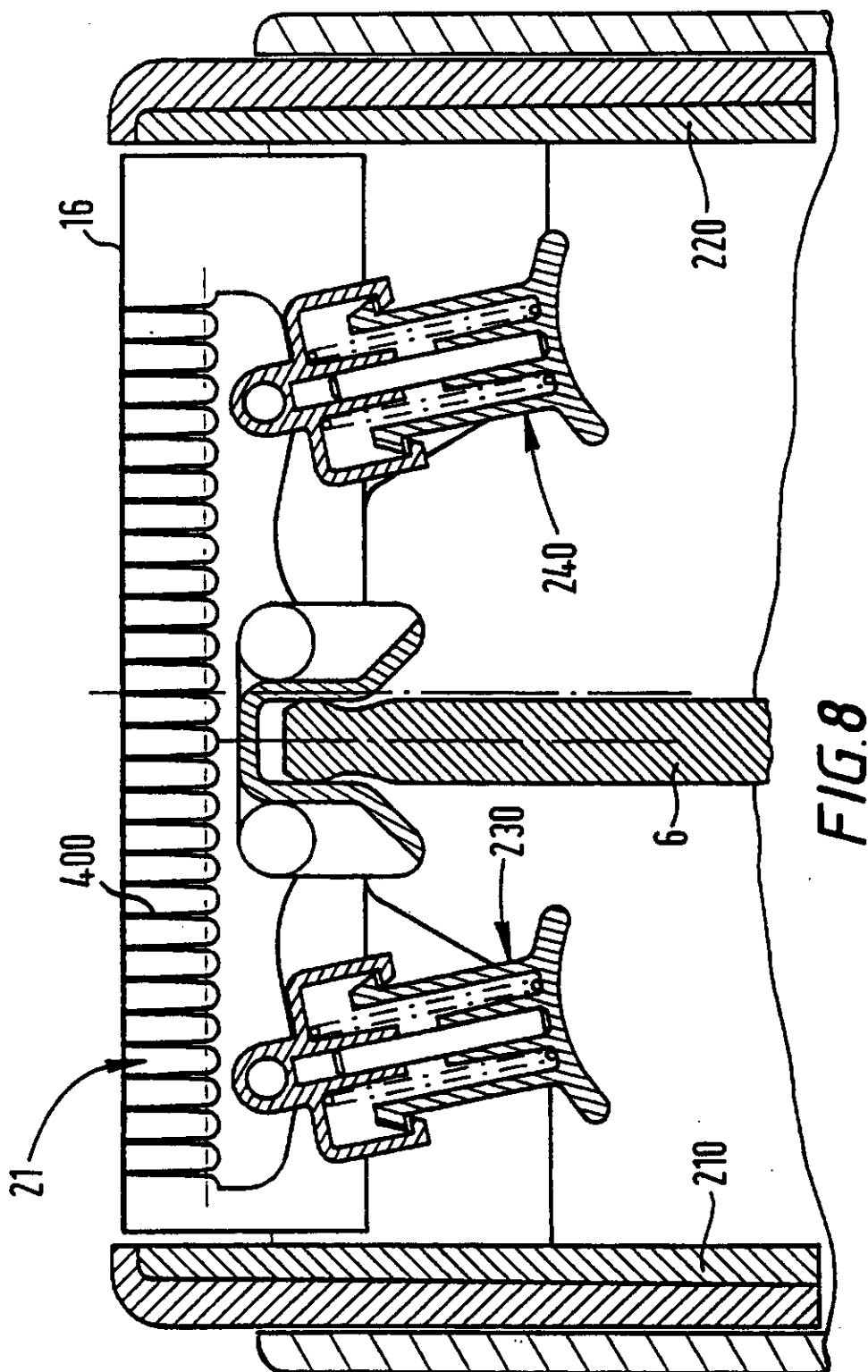


FIG. 7



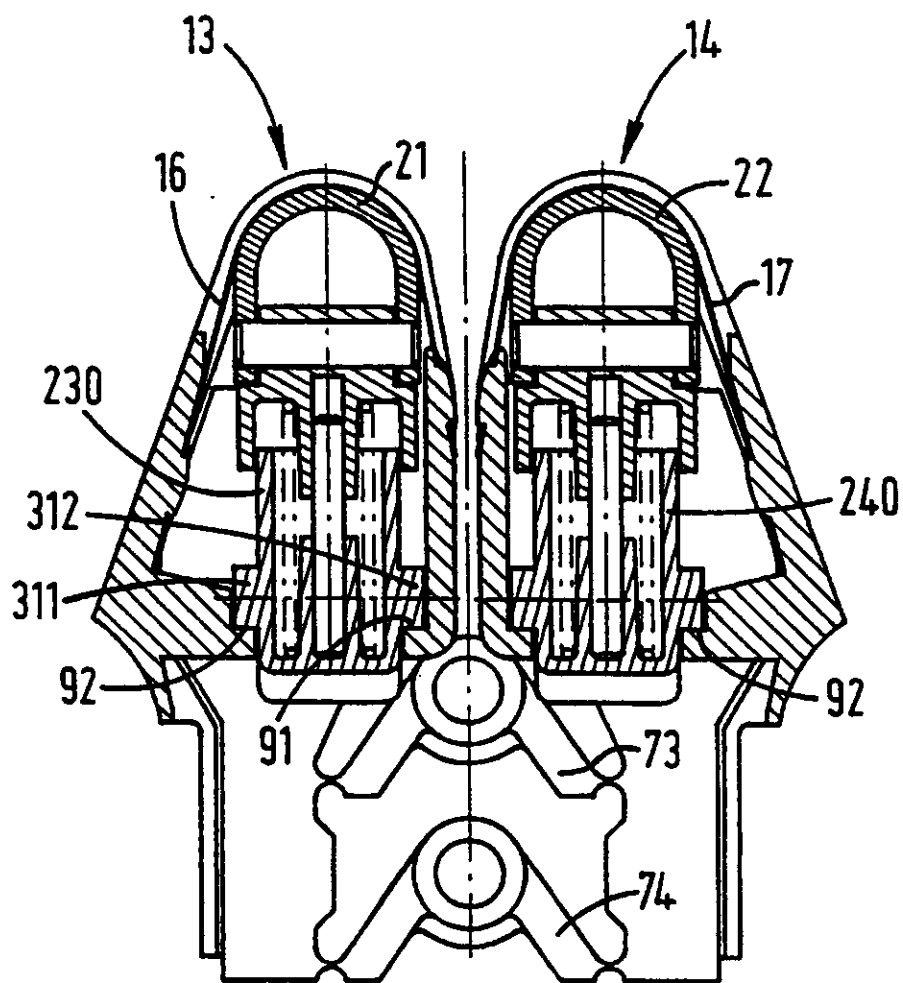


FIG. 9a

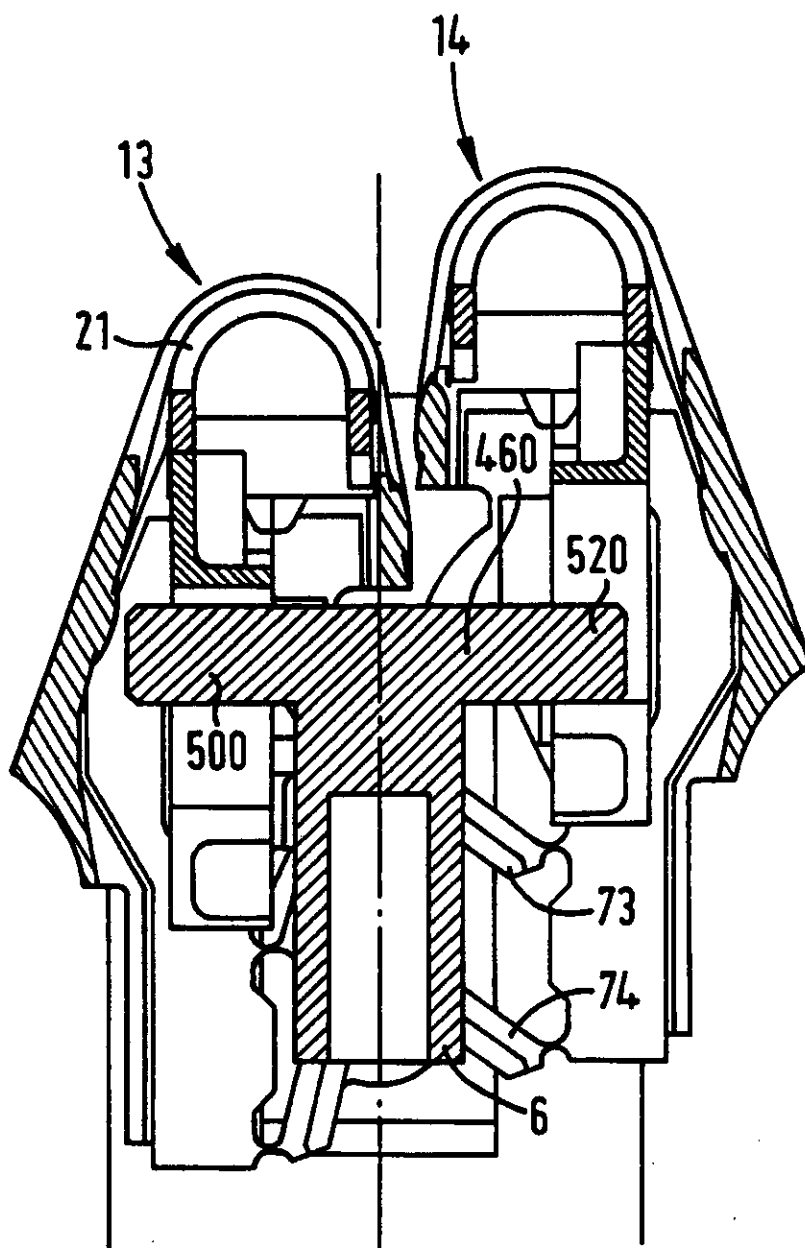


FIG. 9b

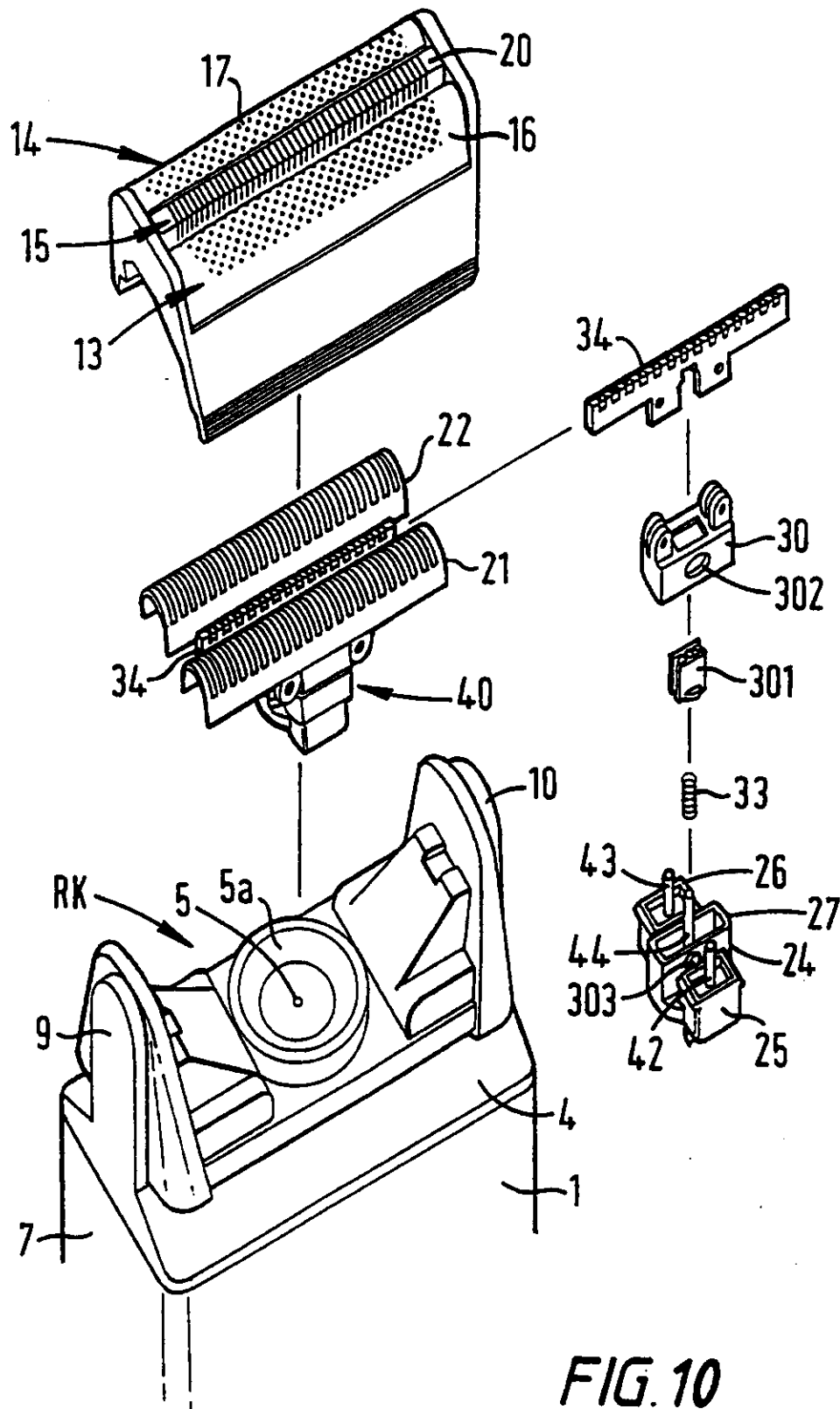


FIG. 10

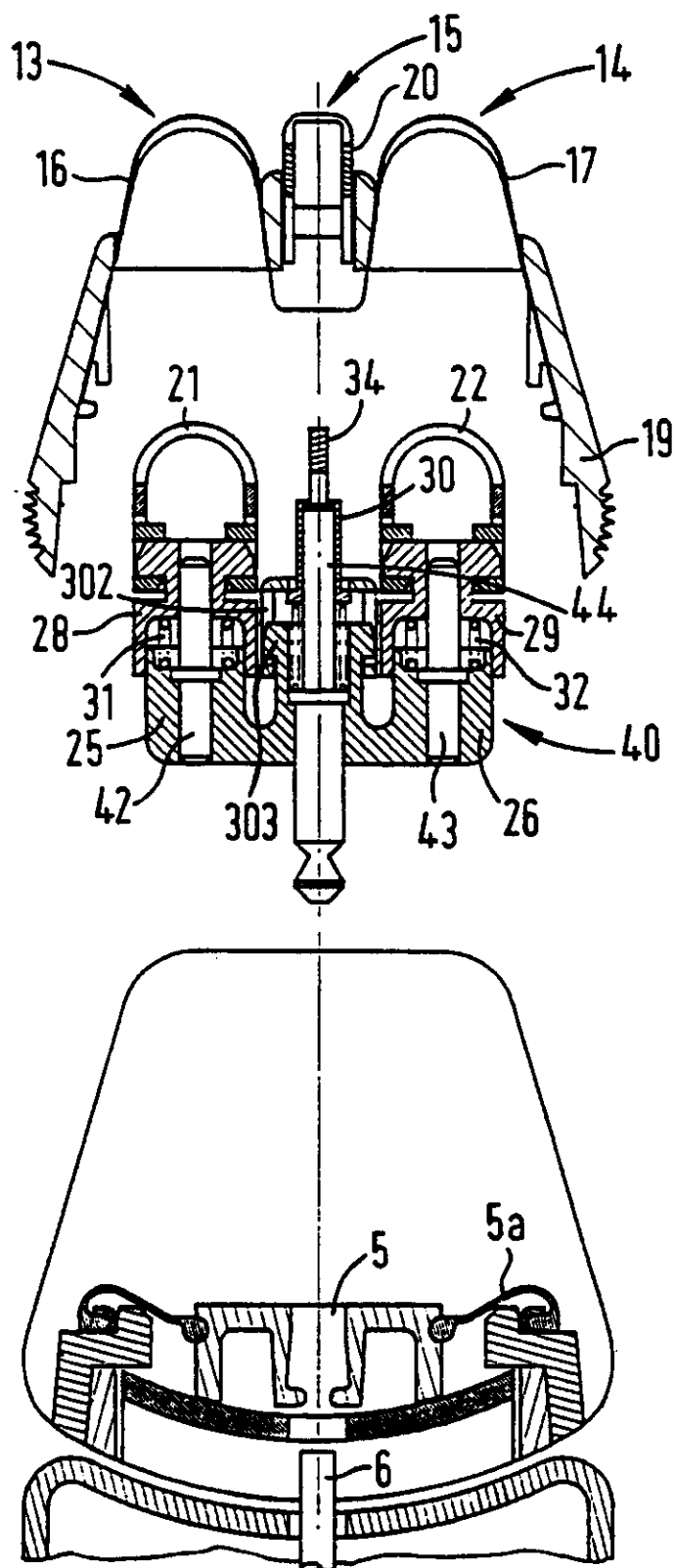
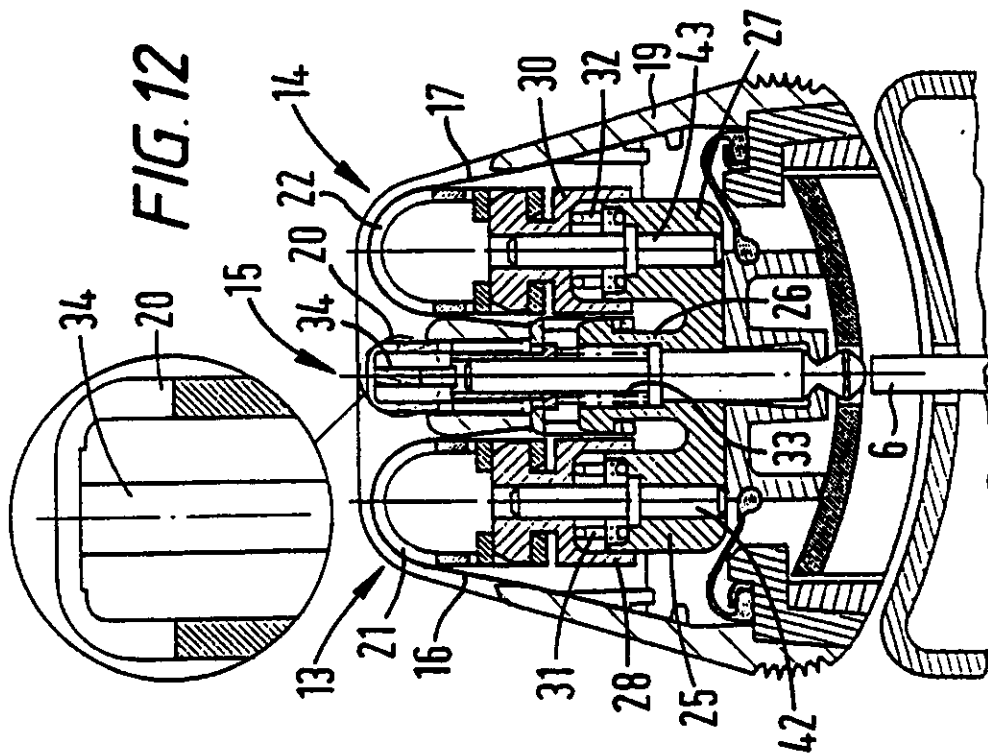
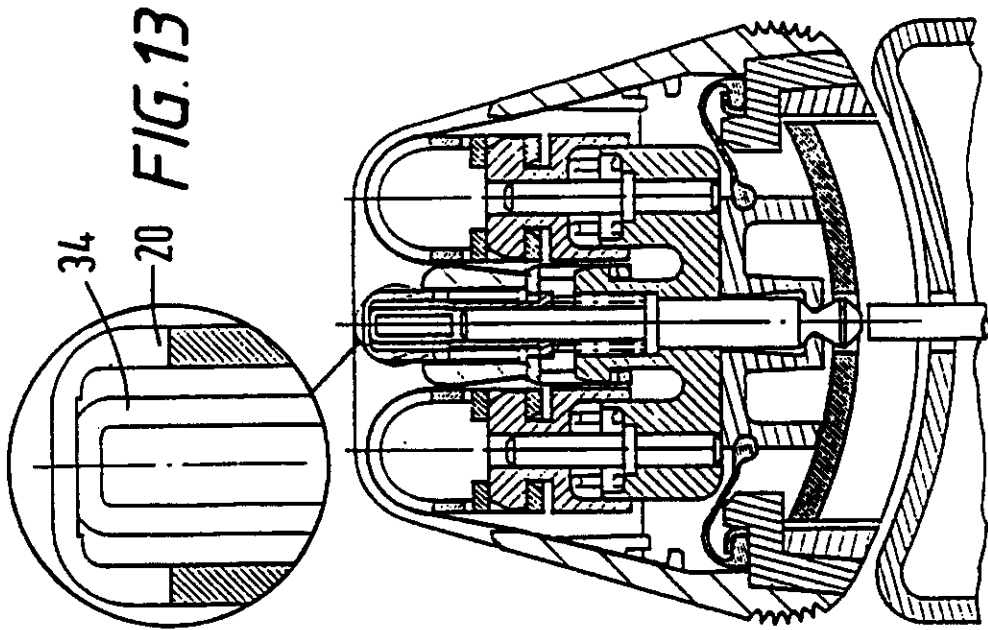


FIG. 11



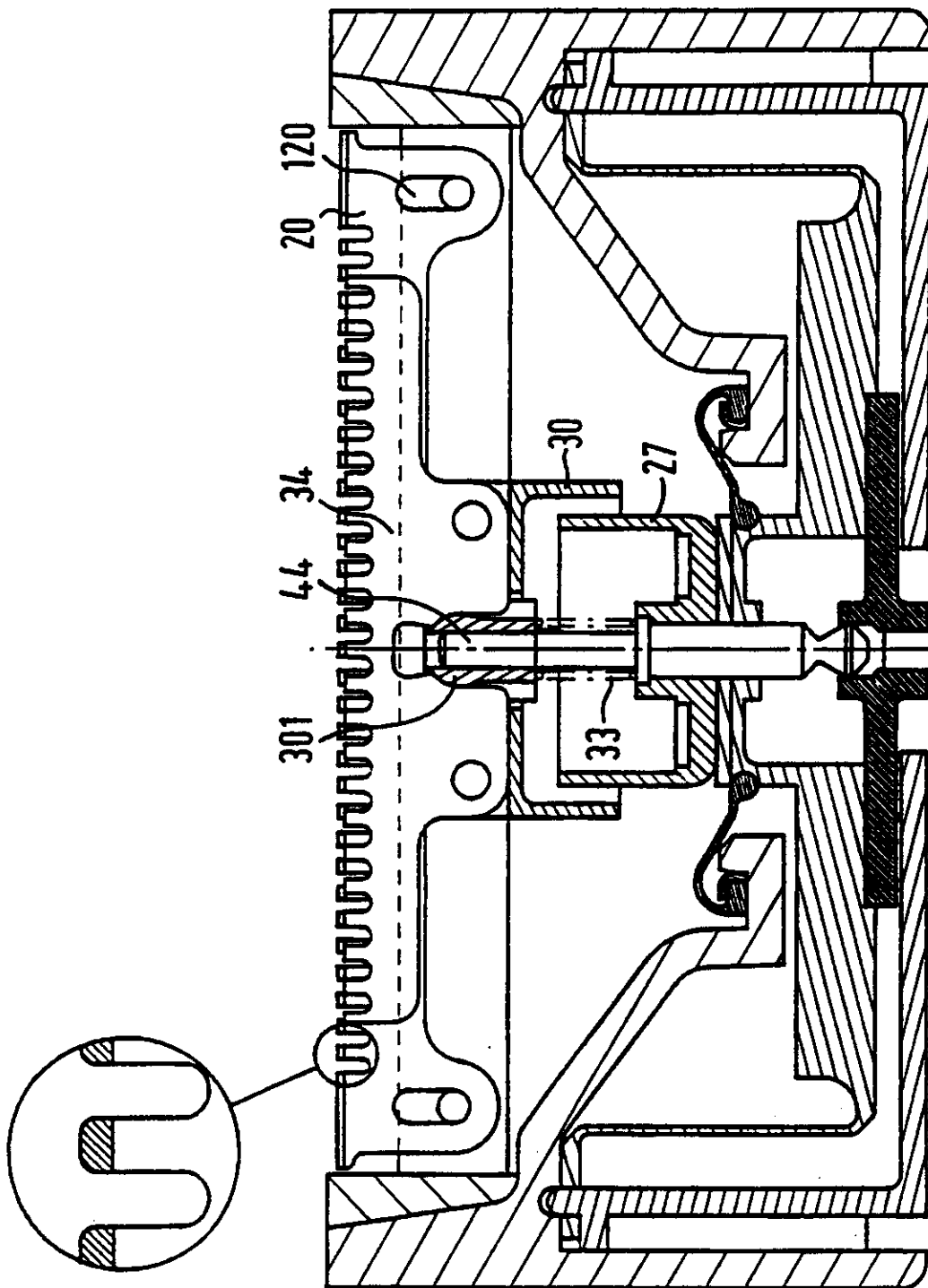


FIG. 14

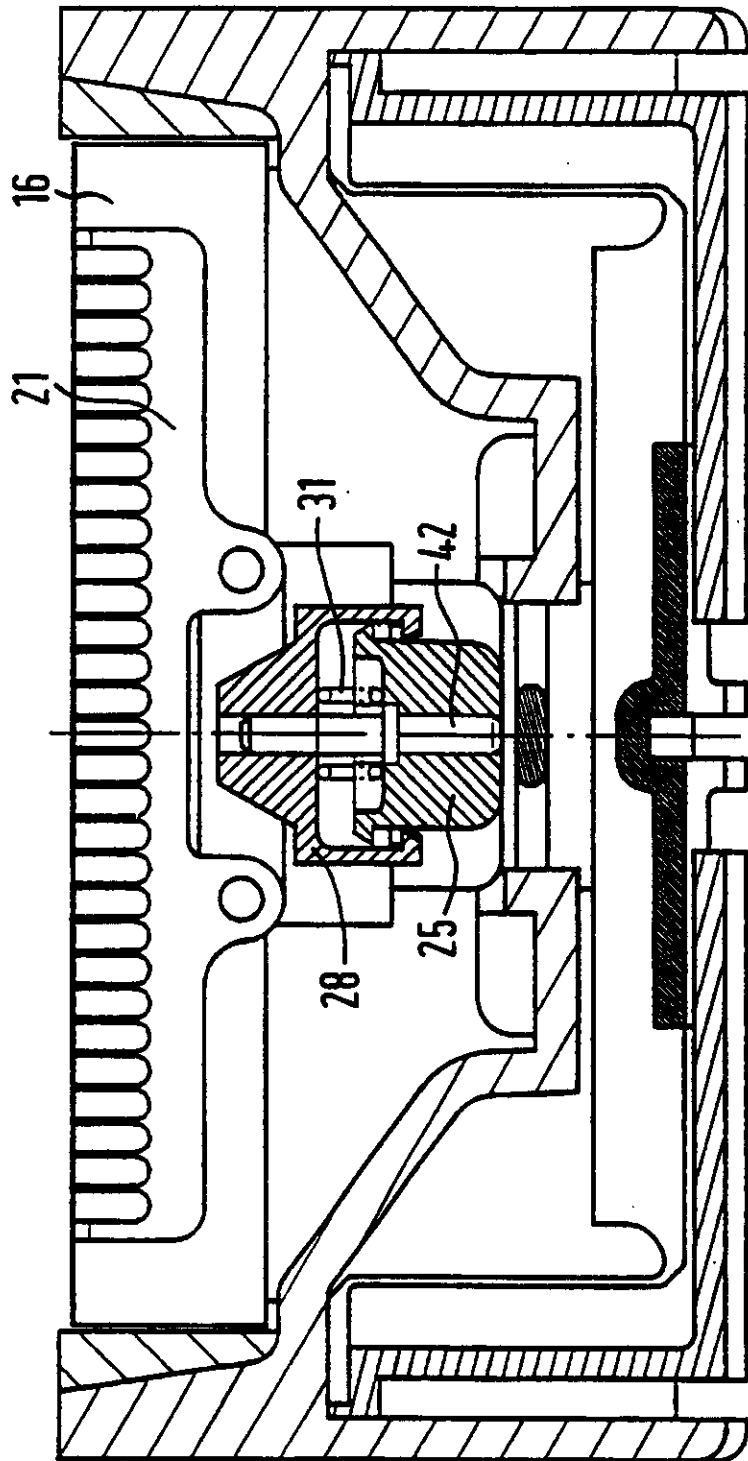


FIG.15

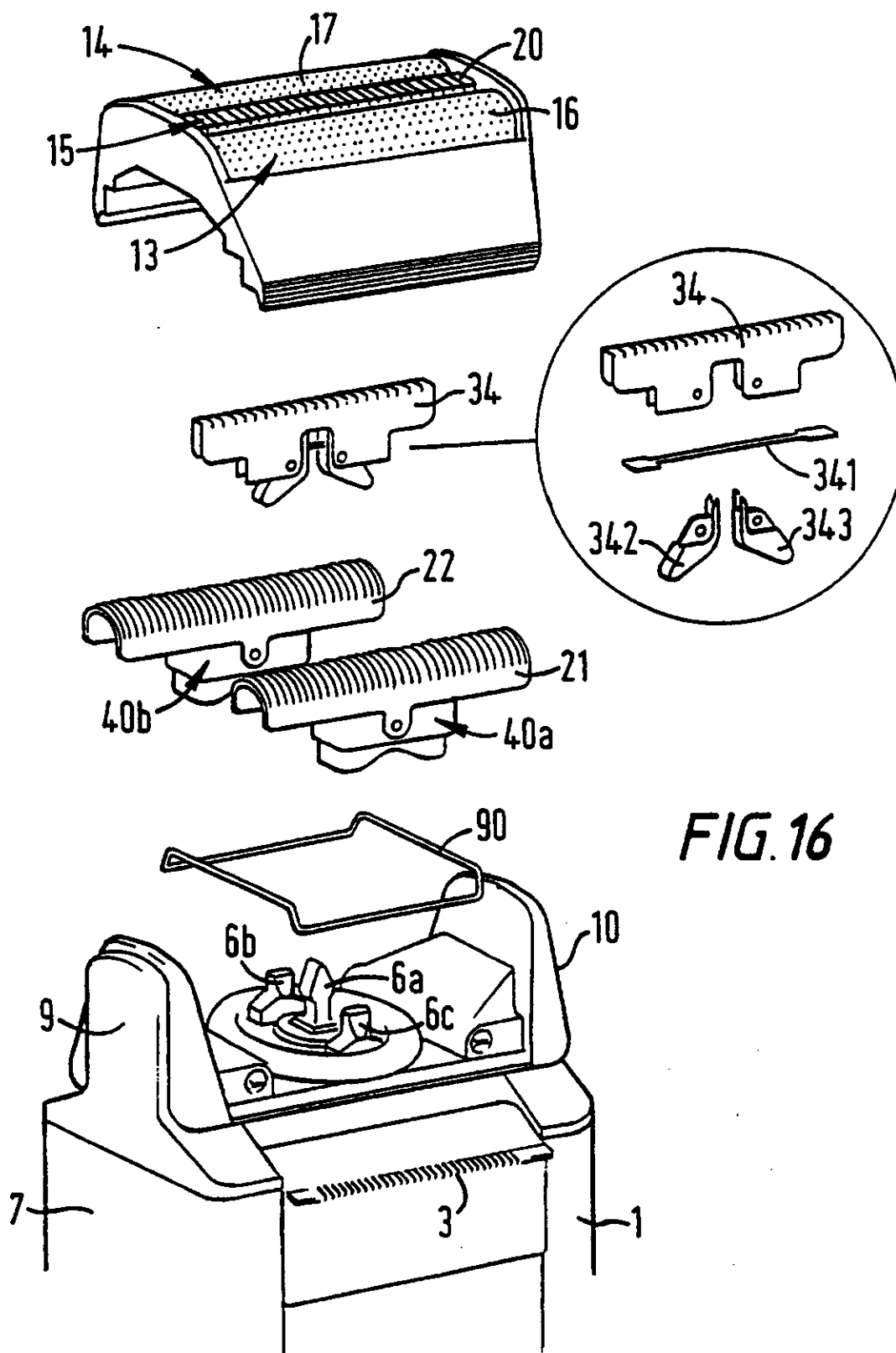


FIG. 16

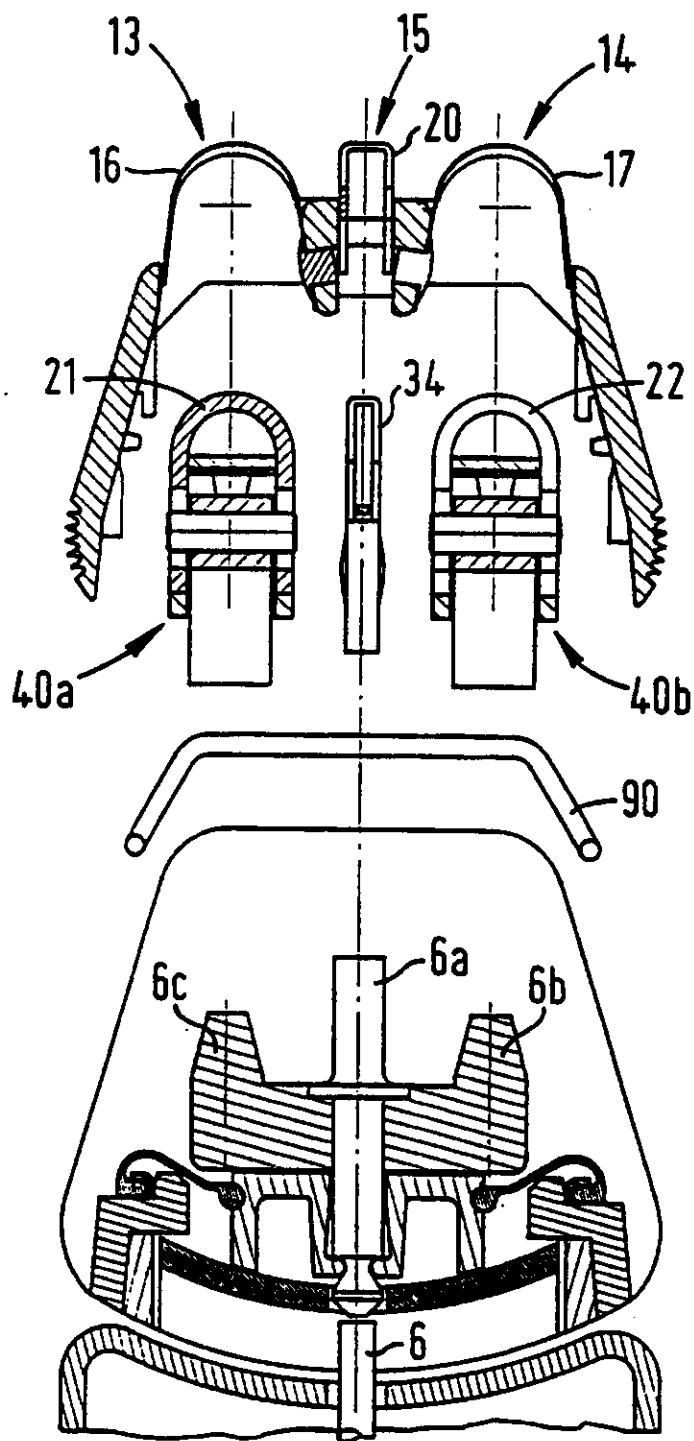
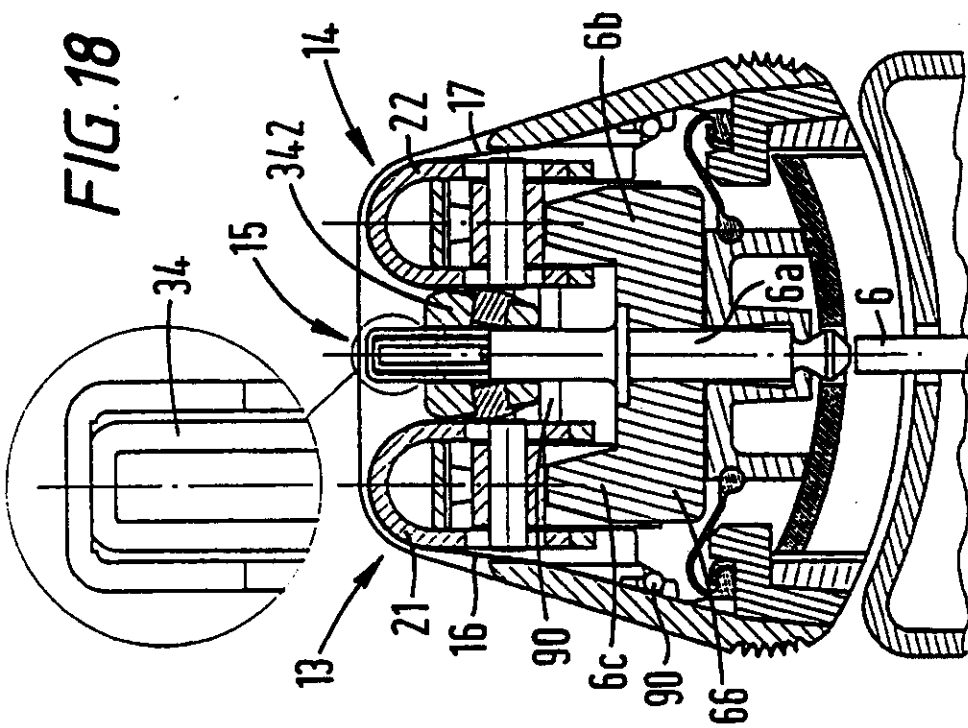
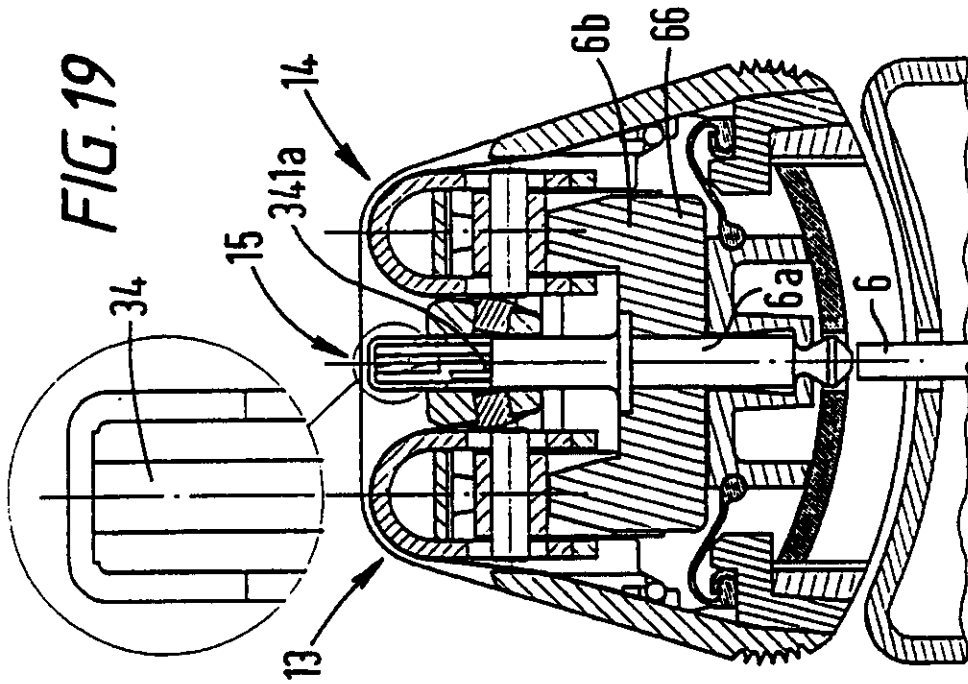


FIG. 17



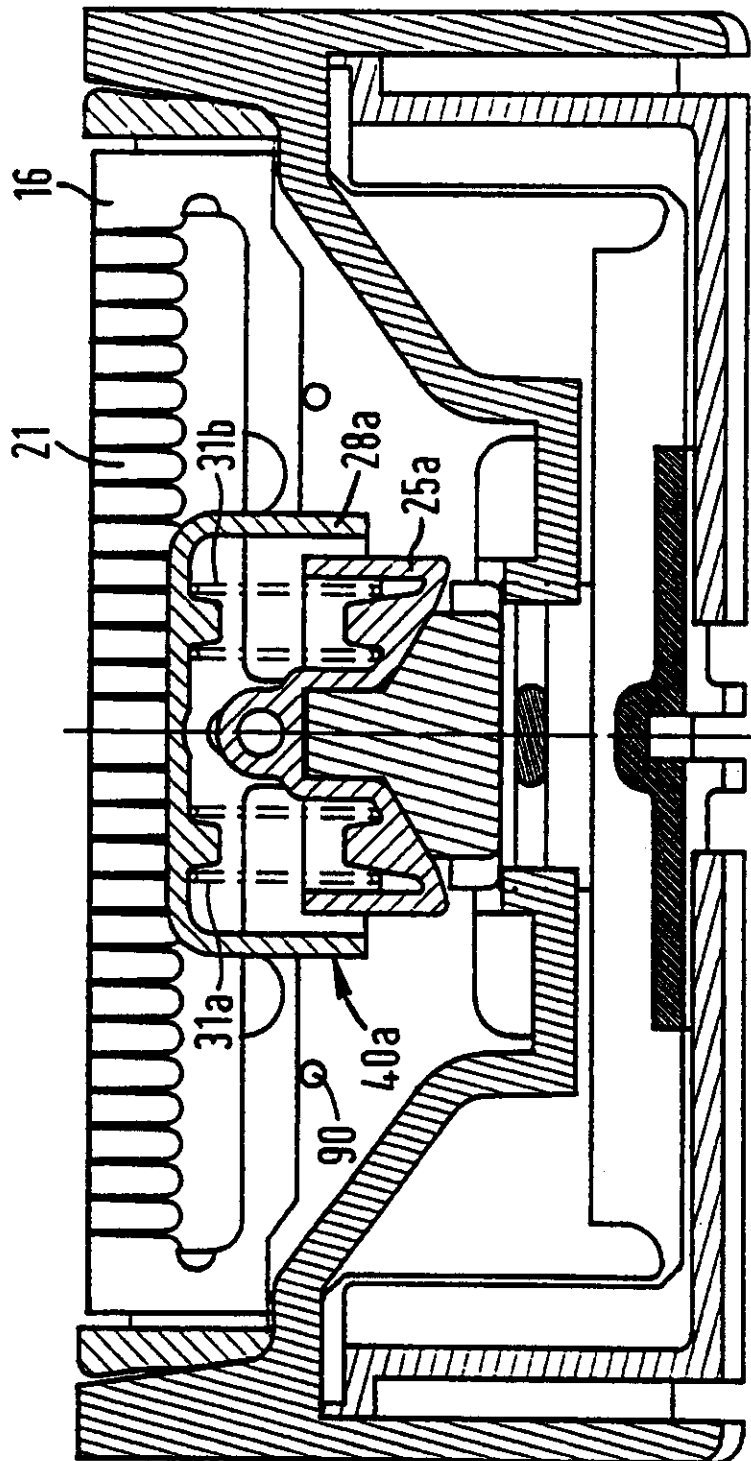


FIG. 20

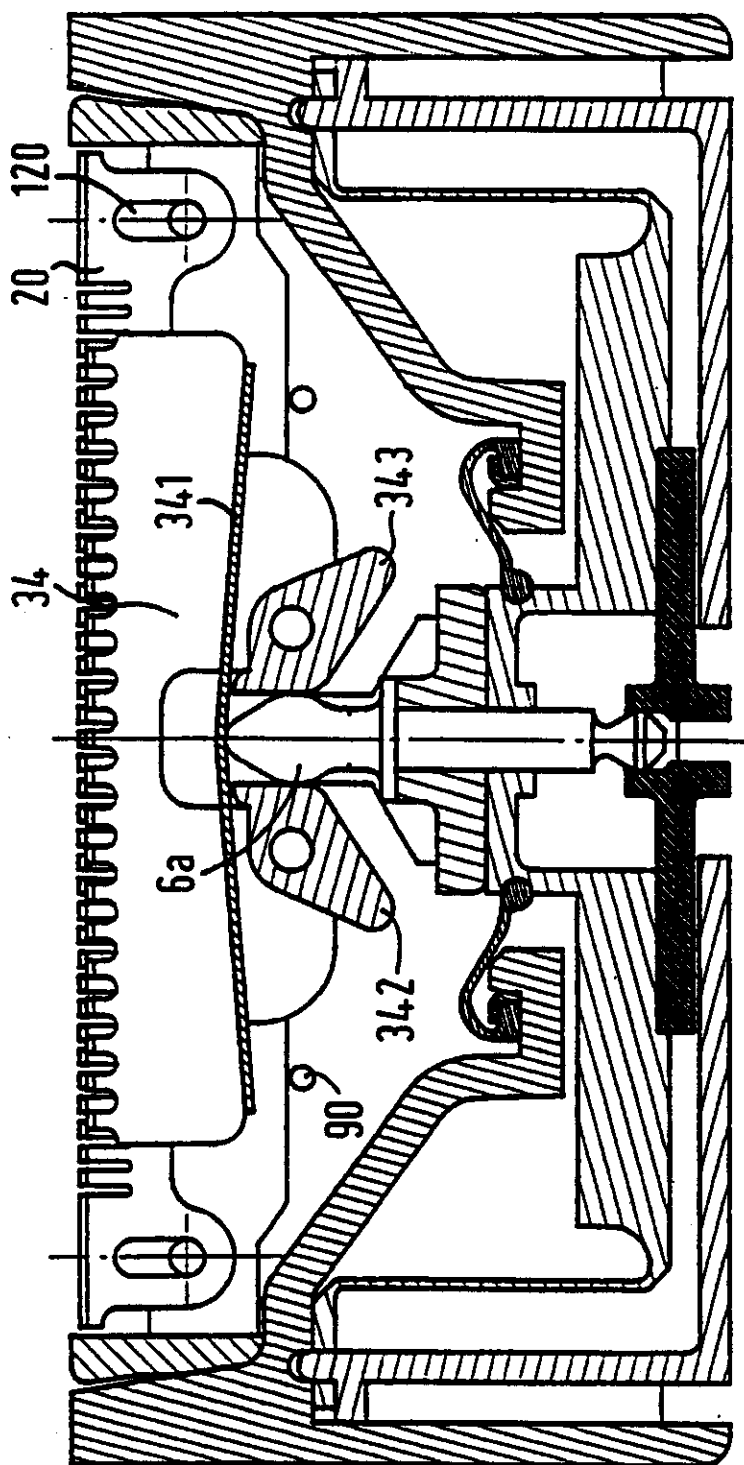


FIG. 21

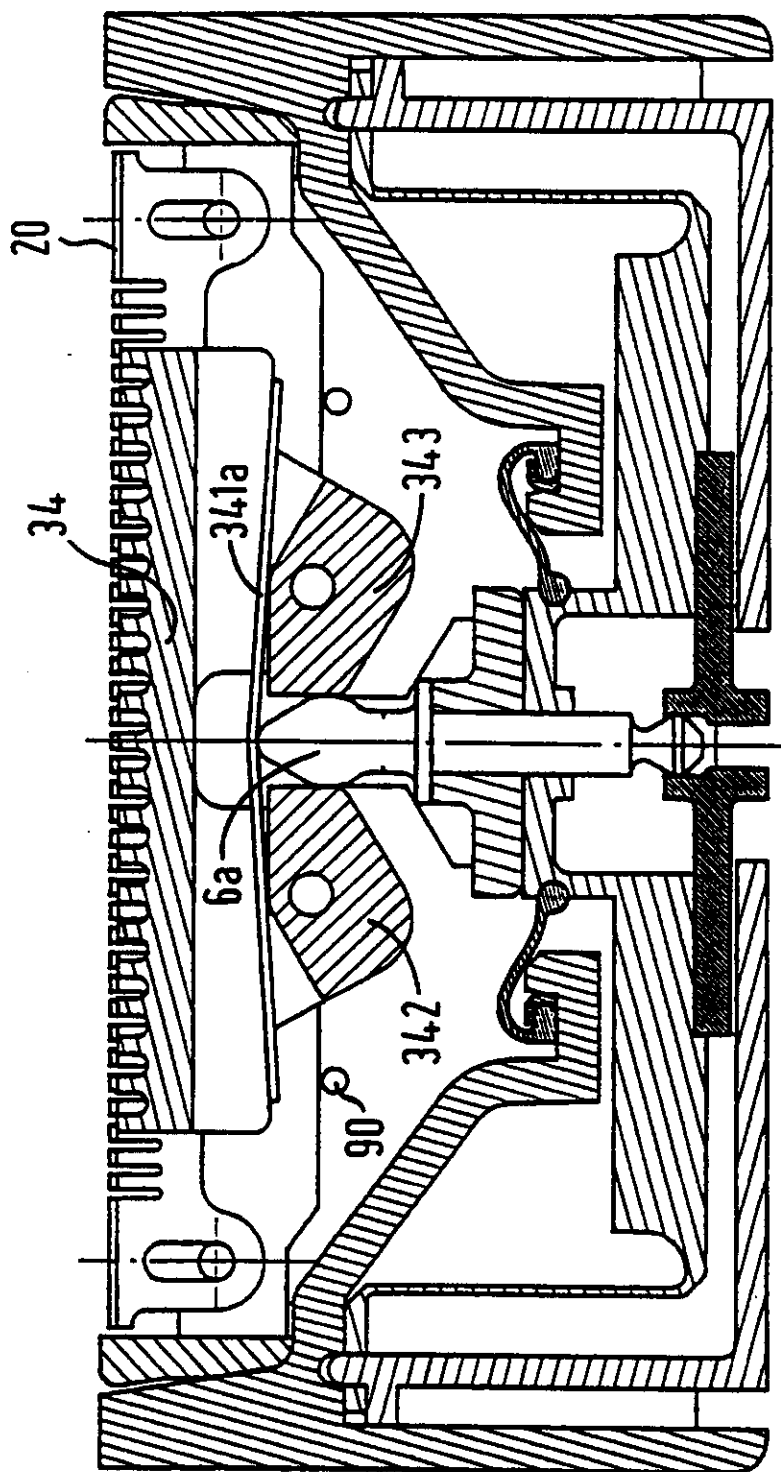


FIG. 22

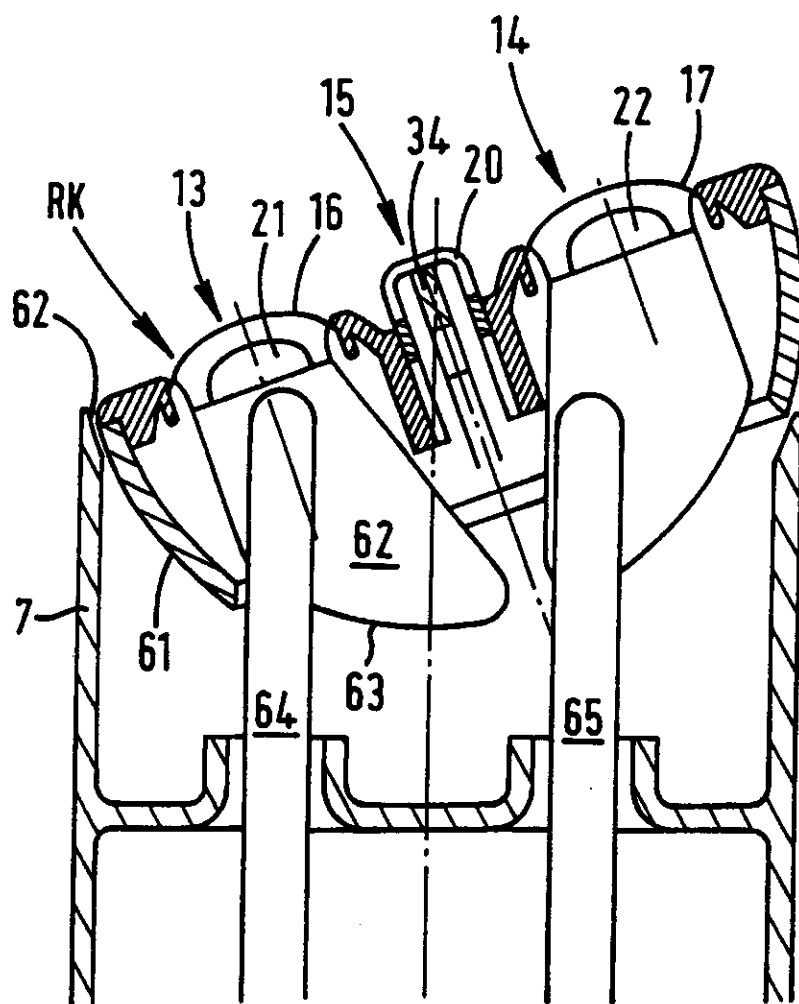
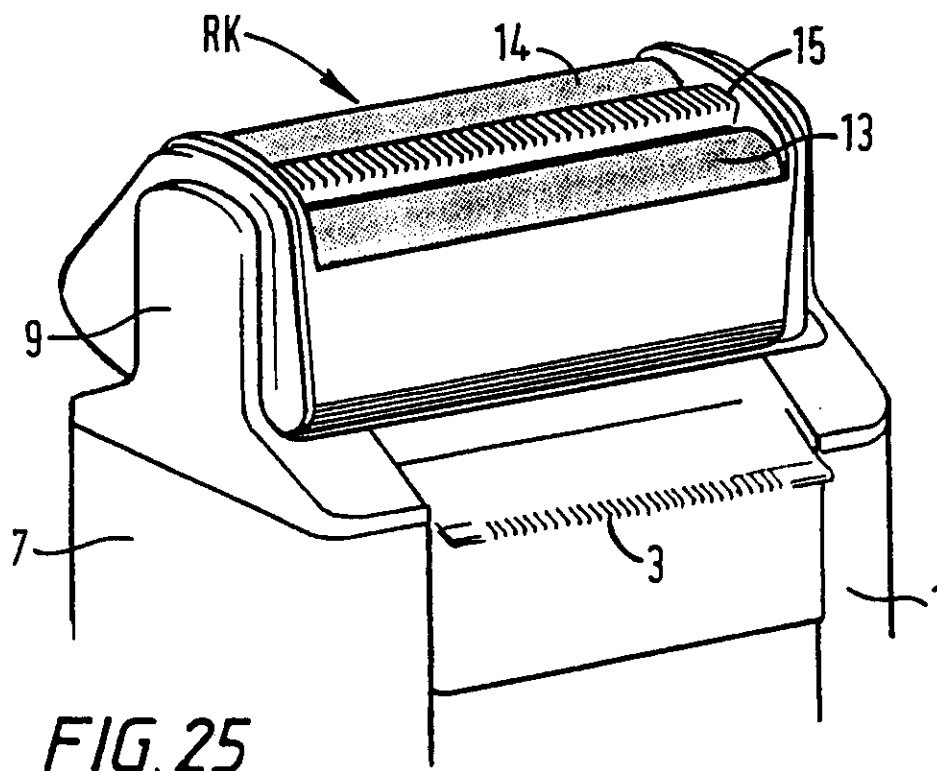
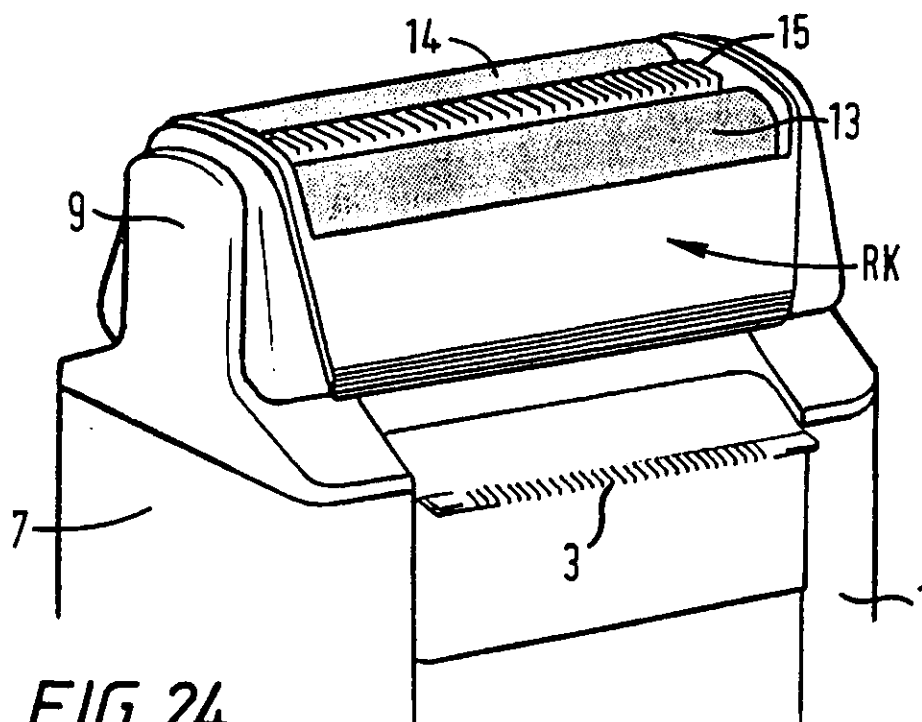
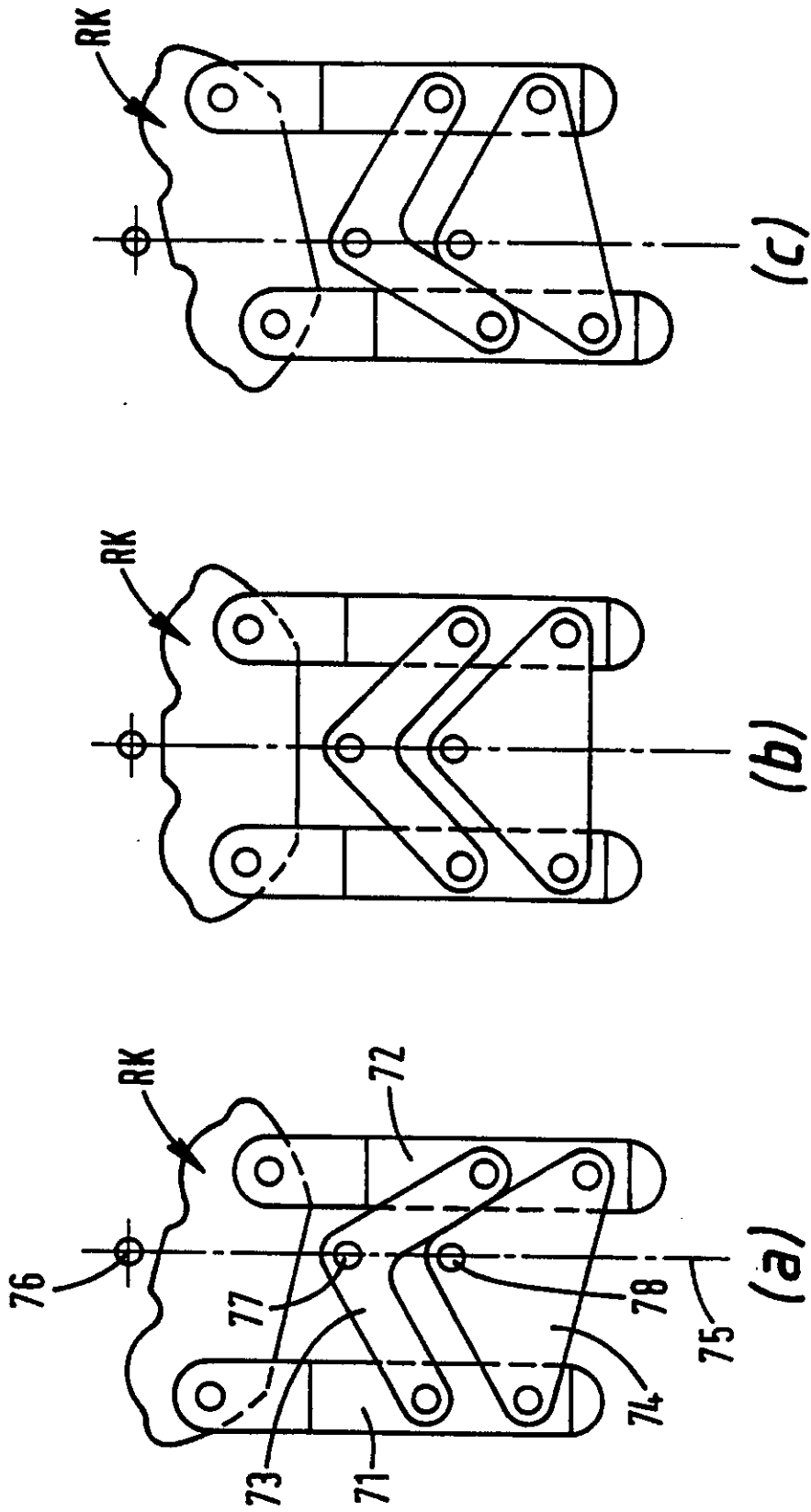


FIG. 23





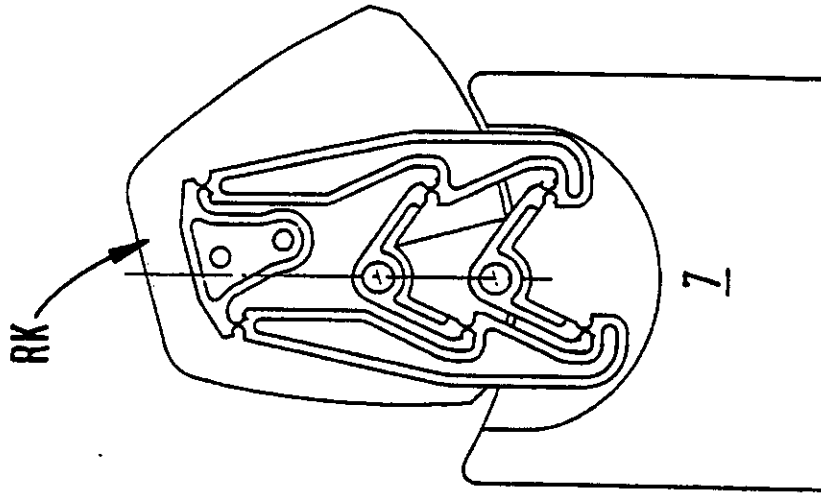


FIG. 29

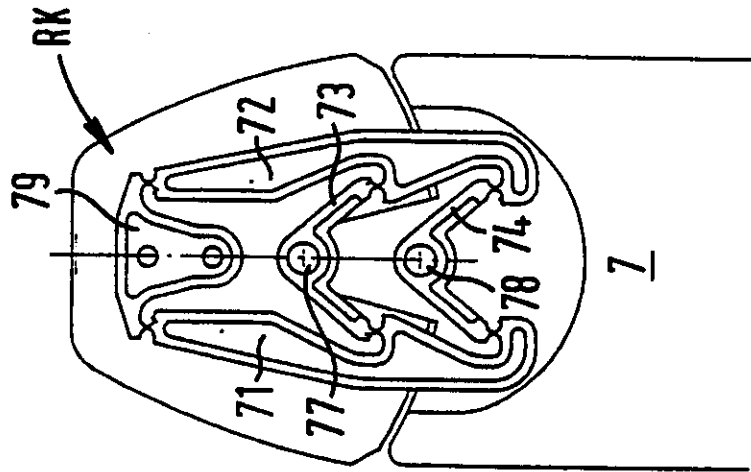


FIG. 28

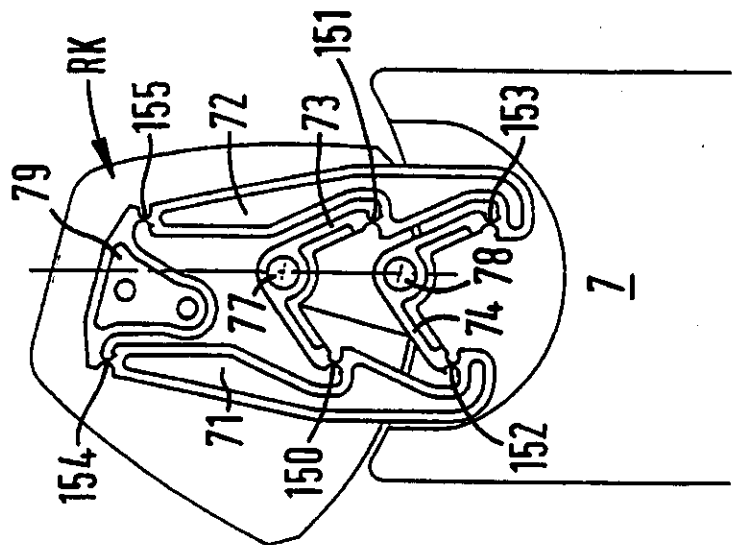


FIG. 27

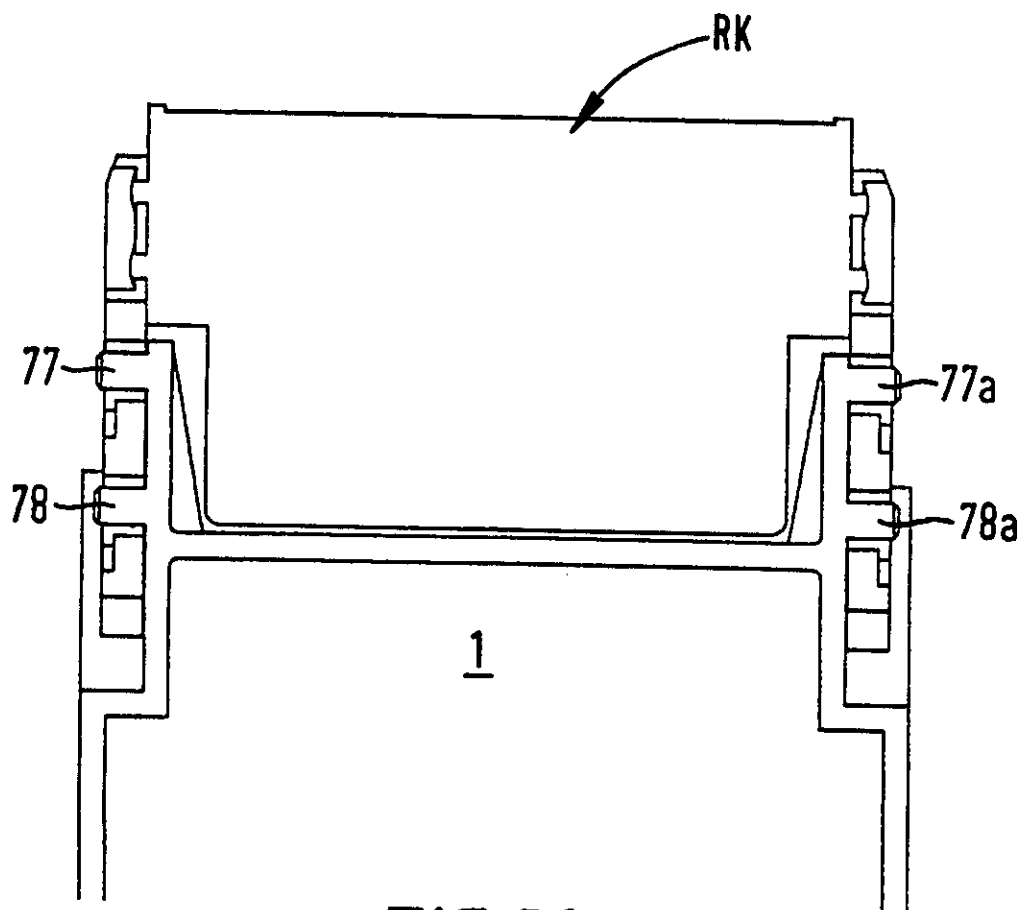


FIG. 30

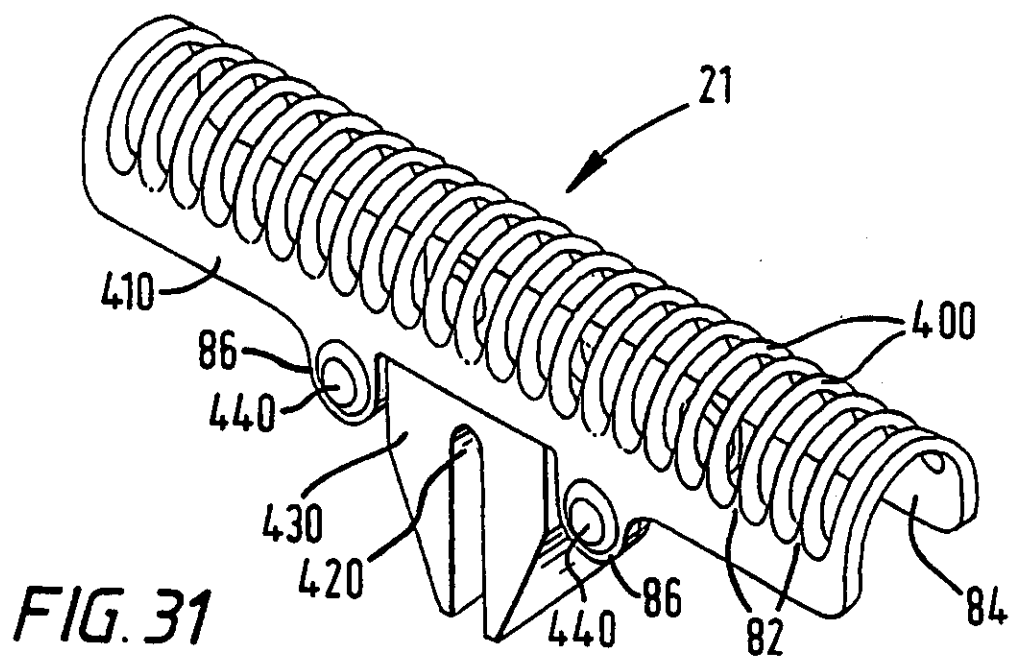


FIG. 31

REGISTER ENTRY FOR EP0618853

European Application No EP93901709.1 filing date 18.12.1992

Priorities claimed:

20.12.1991 in United Kingdom - doc: 9127102

20.12.1991 in United Kingdom - doc: 9127092

Divisional EP95109208.9

PCT EUROPEAN PHASE

PCT Application PCT/EP92/02960 Publication No WO93/12916 on 08.07.1993

Designated States BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE AT

Title DRY-SHAVING APPARATUS.

Applicant/Proprietor

THE GILLETTE COMPANY, Prudential Tower Building, Boston Massachusetts

02199, United States of America

[ADP No. 50536101001]

Inventors

MATTHIAS WETZEL, Zeiselstrasse 23, D-60318 Frankfurt, Federal Republic of
Germany

[ADP No. 62322219001]

TERENCE GORDON ROYLE, 21 Foxcote, Wokingham, Berkshire PG11 3PG, United
Kingdom

[ADP No. 62322227001]

RAYMOND GRAHAM PARSONAGE, 40 Highway Road, Maidenhead, Berkshire SL6 5AE,
United Kingdom

[ADP No. 62322235001]

Classified to

B26B

Address for Service

HOFFMANN EITLE & PARTNER, Sardinia House, 52 Lincolns Inn Fields, LONDON,

WC2A 3LZ, United Kingdom

[ADP No. 00009050001]

EPO Representative

STEPHEN JOHN AVERY, Hoffmann, Eitle & Partner, Patent-und Rechtsanwälte,
Arabellastrasse 4, D-81925 München, Federal Republic of Germany

[ADP No. 62042767001]

Publication No EP0618853 dated 12.10.1994

Publication in English

Examination requested 24.06.1994

Patent Granted with effect from 13.03.1996 (Section 25(1)) with title

DRY-SHAVING APPARATUS

03.01.1997 EPO: Opposition filed on 13.12.1996

Entry Type 25.1 Staff ID. RD06 Auth ID. EPT

**** END OF REGISTER ENTRY ****

OA80-01
EP

OPTICS - PATENTS

29/01/97 11:39:27
PAGE: 1

RENEWAL DETAILS

PUBLICATION NUMBER EP0618853

PROPRIETOR(S)

THE GILLETTE COMPANY, Prudential Tower Building, Boston
Massachusetts 02199, United States of America

DATE FILED 18.12.1992

DATE GRANTED 13.03.1996

DATE NEXT RENEWAL DUE 18.12.1997

DATE NOT IN FORCE

DATE OF LAST RENEWAL 18.11.1996

YEAR OF LAST RENEWAL 05

STATUS PATENT IN FORCE

**** END OF REPORT ****