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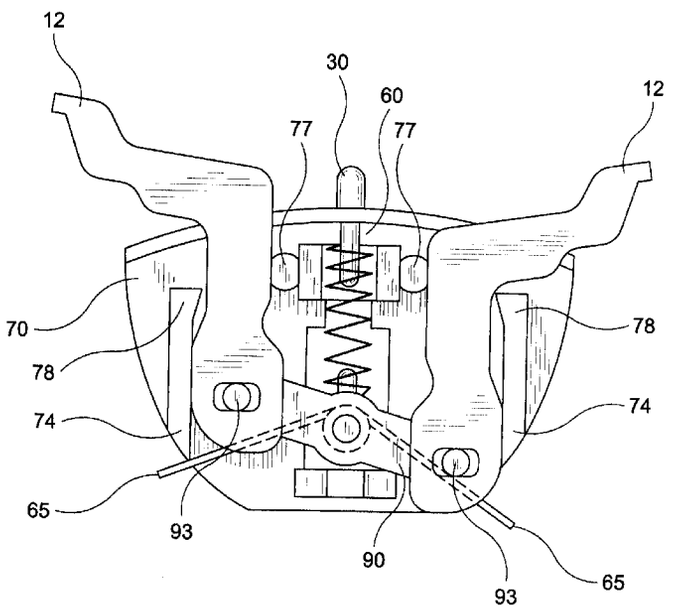
## (54) Razor providing pivoting and swivelling razor head support

(57) Razors adapted to support a razor head during shaving while permitting the razor head to move relative to the razor in response to forces encountered during shaving. Preferred embodiments allow a razor head to swivel and also to pivot about an axis normal to a central axis of the razor and normal to an imaginary axis defined by the points of attachment (12) of the razor to a razor head. Preferred embodiments restrict the movement of the engagement arms (10) to paths substantially parallel to a central longitudinal axis (L) of the razor. In this manner, a lateral component of razor head movement along an axis defined by engagement portions (12) of the engagement arms is avoided.

According to another aspect, two biasing members (60,65) are arranged in cooperative engagement to provide restoring forces of three different magnitudes to three different elements (93;53).

FIG-4

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## Description

The present invention is directed to a razor which supports a razor head and, more particularly, to a razor which permits a razor head to swivel and pivot relative to a shaving stroke.

It is generally accepted that optimum shaving closeness and comfort are highly dependent on the angle at which skin engaging elements contact the skin surface being shaved. Shaving systems have been proposed which provide a razor head having a housing with relatively movable skin engaging elements, including a guard element, one or more blades and a cap member. It has also been suggested to provide various degrees of movement of the entire razor head relative to the razor which supports the razor head. The various embodiments of the present invention are directed to improvements in razors which permit a razor head to swivel and pivot in response to forces encountered during shaving.

Some of the previously disclosed arrangements for providing multiple degrees of movement include PCT Publication 93/20983 and U.K. Patent GB 2,116,470 which both disclose "swivel" movement which is commonly defined as pivoting about an axis which is parallel to an axis defined by the razor-cartridge engagement members, as well as "rocking" motion which is arcuate movement of the razor head. Such arcuate movement by definition includes a lateral component, i.e. points along the sharpened blade edge and elsewhere on the cartridge move laterally relative to the shaving stroke path. Another system disclosed in GB 2,172,236 permits swivel motion and pivoting, but the pivoting movement causes blade movement to leave the notional plane of the surface being shaved. U.S. Patent No. 5,535,518 discloses a four bar linkage system which allows pivoting and swivelling, but does not show springs or biasing elements for returning the razor head to a neutral position after the removal of shaving forces. The present invention is directed to improvements to shaving systems which allow a razor head to swivel and pivot relative to a razor during shaving.

According to a first aspect of the invention there is provided a razor as defined in Claim 1. According to a second aspect of the invention there is provided a shaving system as defined in Claim 2.

According to a third aspect of the invention there is provided a razor as defined in Claim 4.

According to a fourth aspect of the invention there is provided a razor as defined in Claim 15.

Various embodiments of the present invention are directed to razors adapted to support a razor head during shaving while permitting the razor head to move relative to the razor in response to forces encountered during shaving. The various embodiments described herein allow a razor head to swivel and also to pivot about an axis normal to a central axis of the razor and normal to an imaginary axis defined by the points of attachment of the razor to a razor head.

Preferred embodiments of the present invention restrict the movement of the engagement arms of a razor head to paths substantially parallel to a central longitudinal axis of the operative part of the razor. In this manner, no lateral component of blade movement is permitted along an axis defined by the engagement points of the engagement arms. The engagement arms are also preferably restricted to movement within a single plane. The various embodiments provide shaving systems with improved blade-to-skin contact independent of wrist movement, while simultaneously reducing the amount of lateral movement of the razor head relative to the shaving path. As used herein, the term "razor head" is meant to include cartridges adapted to be connected to a separate razor as well as the operative cutting portion of a disposable razor wherein the handle and cutting portion are formed as a single unit.

In another preferred embodiment of the invention, razors are provided with a plunger for returning a swivelling razor head to a predetermined position when shaving forces have been removed, a pair of engagement arms for providing pivoting motion, and an actuator for moving the engagement portions of the engagement arms closer together for loading and unloading a razor head. A first biasing member, e.g. a coil spring, biases the plunger forwardly while a second biasing member, e.g. a torsion spring, biases the engagement arms to a predetermined "at rest" position upon the removal of external shaving forces. Advantageously, both the first biasing member and the second biasing member urge the actuator rearwardly to the "at rest" position. This arrangement advantageously permits the use of greater spring forces on the actuator than on either the engagement arms or the plunger, without requiring a third biasing member.

These and other advantages of a preferred embodiment of the invention are described in further detail below, by way of example only, with reference being made to the accompanying drawings in which:

Figure 1 is a top perspective view with sections removed of one embodiment of the present invention.

Figures 2A and 2B collectively show an exploded bottom view of the razor shown in Figure 1.

Figures 3-5 are top views showing the engagement arms of the razor shown in Figure 1 in various positions.

Figure 1 is a top view of one razor of the present invention with sections removed. This illustrated embodiment is designed to engage a razor head (not shown) with a pair of engagement arms 10a, 10b which permit the razor head to swivel and pivot relative to the razor in response to forces encountered during shaving.

The illustrated razor head of the present invention comprises a pair of engagement arms 10, a plunger 30, an actuator 50, a compression spring 60, a torsion spring 65, a top cover 70, a base 80, and a slidable cross beam 90. The fork members (engagement arms 10) are pivotally connected to the cross beam 90 and slidably guided by the base 80 and top cover 70. The plunger

30 is provided to return a razor head which has swivelled to a predetermined position while the engagement arms are also biased to return the razor head to a predetermined position, preferably normal to the central longitudinal axis of the razor, after shaving forces have been removed.

The engagement arms 10 comprise engagement pins 12 adapted to be received within recesses of a razor head in a manner which permits the razor head to swivel about an axis substantially parallel to an imaginary axis defined by pins 12. As shown best in Figs. 2A and 2B, the plunger 30 comprises a plunger base 35 having a pair of opposing slots 37 adapted to slidingly receive the sidewalls 75 of a cut out in top cover 70. Slots 37 in plunger base 35 thereby guide plunger 30 forwardly and rearwardly relative to cover 70 along a central longitudinal axis L of the razor. (See Fig.1) The forward portion of plunger 30 which engages a ramped surface of a razor head extends through an opening 72 of cover 70. Rearward movement of the plunger relative to cover 70 can be limited by a pair of detents (not shown). Plunger 30 is forwardly biased and comprises a pin 33 which engages the forward end of coil spring 60. The rearward end of coil spring 60 engages a pin 53 of actuator 50. This arrangement advantageously utilizes a single coil spring to provide forward biasing forces on plunger 30 and rearward biasing forces on an actuator 50 described in further detail below.

As stated above, in addition to swivel motion of the razor head, the razors of the present invention advantageously permit pivoting of the entire razor head on the razor. As used herein, the term "pivoting" is used to define movement of the razor head about an imaginary axis normal to an axis defined by pins 12 of engagement arms 10 and also normal to a central, longitudinal axis **L** of the razor defined by the forward-rearward movement of plunger 30. As used herein, pivoting of a razor head is distinguished from the "rocking" motion of previously suggested systems which included a lateral component relative to the direction of the shaving stroke.

The engagement arms are maintained in a path which is substantially parallel to the central longitudinal axis **L** of the razor by guide walls of the top cover 70 and base 80 which slidingly engage sidewalls of the engagement members. As shown in Figs. 2A and 2B, a first pair of outer, guide walls 74 of top cover 70 engage rear outer sidewalls 14 of engagement arms 10. A pair of downwardly depending ridges 86 of bottom cover 80 slidingly engage rear inner sidewalls 16 of engagement arms 10. Additionally, the outer surfaces of abutments 77 of top cover 70 slidingly engage the inner, forward surfaces 17 of engagement arms 10. Therefore, engagement arms 10 are guided forwardly and rearwardly along paths substantially parallel to the central longitudinal axis **L** of the razor within their range of motion experienced during shaving.

During the loading and unloading of a razor head on to the razor, however, it is desirable to bring the pins 12 of engagement arms 10 closer together. For this purpose, the forward portions of cover sidewalls 74 are each provided with inwardly sloping cam surfaces 78 and the engagement arms are also each provided with corresponding cam surfaces 18. The cam surfaces 18 provided on the outer sidewalls of the engagement arms 10 engage the inwardly sloping cam surfaces 78 of side wall 74 while sloped recesses 19 on the inner sidewalls of the engagement arms permit the engagement arms to move inwardly when moved sufficiently forward to align with the abutments 77. Therefore, when engagement arms 10 are advanced forwardly relative to cover 70 to a point where cam surfaces 78 engage cam surfaces 18 of attachment arms 10, the attachments arms pivot inwardly reducing the space between opposing pins 12 to facilitate loading/unloading of a razor head.

The advancement of the engagement arms 10 is selectively performed by simply advancing an actuator button (shown in phantom in Fig. 1) provided on the top of the razor. The actuator button securely engages a recess 51 of actuator 50 which, in turn, engages the cross beam 90 which, in turn, engages the engagement arms 10. As illustrated in Fig. 2A, a pin 55 of actuator 50 passes through a torsion spring 65 and into a pivot recess 91 in cross beam 90. The bottom of cross beam 90 is provided with a pair of laterally spaced pins 93 which are received within elongated pivoting recesses 13 of the engagement arms 10. From the present description and illustrations, it will be appreciated that the advancement of actuator 50 will cause the advancement of cross beam 90 and the advancement of the engagement arms 10 to a point where they will be moved together by cam surfaces 78. After loading or unloading, the engagement arms 10 are returned to the retracted, spread-apart position by the cooperation of two biasing members in this illustrated embodiment. Coil spring 60 positioned between plunger 30 and actuator 50 urges the actuator 50 rearwardly. Additionally, torsion spring 65 which is positioned over actuator pin 55 and engages the rearward ends of sidewall 74 supplies additional rearwardly directed biasing force on actuator 50 in order to return the engagement arms to the "at rest" position. From the present designation, those skilled in the art will appreciate that the use of two separate springs provides a cumulative, rearwardly directed biasing force which exceeds the restoring forces applied to either the plunger or engagement arms, alone. This arrangement also advantageously minimizes the risk of accidentally dislodging a razor head from the razor if, for example, the razor is dropped.

As shown in Figs. 1, 2A and 2B the linear segments of torsion spring 65 are also positioned in contact with or very close proximity to pins 93 of cross beam 90. Therefore, when one of the engagement arms is urged rearwardly during shaving causing the cross beam 90 to pivot about pivot recess 91, the pin 93 on that side of the cross beam 90 which moves rearwardly will engage

the corresponding linear segment of torsion spring 65. When the shaving force is removed, torsion spring 65 will return cross beam 90 to its equilibrium position, thereby restoring engagement arms 10 to their "at rest" position.

It will be appreciated that with reference to Figs. 3-5, the pivoting linkage provided by cross beam 90 about pivot recess 91 causes one engagement arm to advance linearly forwardly when the opposite engagement arm is forced rearwardly. This pivoting motion cooperates with the swivel motion of the razor head in order to provide optimum engagement between the skin engaging elements of the razor head and the skin surface being shaved. Figure 3 illustrates the engagement arms in an "at rest" equilibrium position wherein the engagement arms are not subject to external forces and the engagement arms are retracted and spaced apart. In Figure 4, the engagement arms are illustrated with the right engagement arm forced rearwardly which causes the left engagement arm to advance forwardly. From the present description and illustrations, it will be appreciated that the engagement arms lie in a single plane and in the preferred illustrated embodiments, do not leave this plane even when they move in response to external forces. Figure 5 illustrates the razor with both engagement arms positioned forwardly, having been advanced by advancing the actuator button thereby drawing the engagement portions of the engagement arms inwardly for loading or unloading a razor head

Since the engagement arms move linearly, there is no lateral movement of the razor head along an axis defined by the engagement points of the engagement arms relative to the path of the shaving stroke. Furthermore, any lateral movement which may occur at other locations of the razor head is advantageously reduced.

**Claims**

1. A razor for movably supporting a razor head comprising:

   a base;
   at least two engagement arms slidably supported relative to said base, each of said engagement arms comprising an engagement portion for pivotally supporting a razor head on the razor; and
   a cross beam connected to said engagement arms and supported for pivotal and sliding movement relative to said base.

2. A shaving system comprising a razor and a razor head pivotally connected to said razor, said razor comprising:

   at least two engagement arms movably supported relative to said base, each of said engagement arms comprising an engagement portion for pivotally supporting said razor head on the razor;
   wherein a portion of said razor head disposed along an axis between said engagement portions does not move laterally relative to said razor when said razor head pivots on said razor.

3. A razor or shaving system according to claim 1 or claim 2 wherein said engagement arms move along substantially parallel paths in response to shaving forces exerted on a razor head.

4. A razor for movably supporting a razor head comprising:

   a base;
   at least two engagement arms slidably supported relative to said base for movement along substantially parallel paths, each of said engagement arms comprising an engagement portion for pivotally supporting a razor head on the razor; and
   means for restoring said engagement arms after the removal of external shaving forces.

5. A razor according to claim 4 further comprising a pivotable, cross beam connected to said engagement arms and supported for movement relative to said base.

6. A razor or shaving system according to any preceding claim wherein said engagement arms remain in a single plane when moving in response to shaving forces exerted on a razor head.

7. A razor or shaving system according to any preceding claim wherein said engagement arms are maintained in a first position in the absence of external forces and said razor further comprises means for restoring said engagement arms to said first position after external shaving forces are removed.

8. A razor or shaving system according to claim 4 or claim 7 wherein said restoring means comprises a torsion spring.

9. A razor or shaving system according to claim 4 or claim 7 further comprising a forwardly biased, movable plunger for restoring a razor head from a swivelled position to a non-swivelled position.

10. A razor or shaving system according to claim 9 further comprising means for biasing said plunger forwardly.

11. A razor or shaving system according to claim 10 further comprising an actuator connected to said en-

gagement arms for moving said engagement portions closer together.

**12.** A razor or shaving system according to claim 10 wherein said biasing means and said restoring means bias said actuator rearwardly.

**13.** A razor according to claim 5 or any claim dependent therefrom wherein said cross beam is supported for pivotal and sliding motion relative to said base.

**14.** A shaving system according to claim 2 or any claim dependent therefrom wherein:

said engagement arms are movable substantially parallel to a first axis and biased by a means for biasing said engagement arms;
said shaving system further comprises a plunger movable along a second axis which is substantially parallel to said first axis and biased by a means for returning said plunger; and the shaving system includes
a third element movable along a third axis and biased by said biasing means and said returning means.

**15.** A razor for movably supporting a razor head, said razor comprising:

a first element movable along a first axis and biased by a means for biasing said first element;
a second element movable along a second axis which is substantially parallel to said first axis and biased by a means for returning said second element; and
a third element movable along a third axis and biased by said biasing means and said returning means.

**16.** A razor according to claim 15 wherein said first element comprises a plunger.

**17.** A razor according to claim 15 or claim 16 wherein said second element comprises at least one engagement arm.

**18.** A razor according to any of claims 14 to 17 wherein said third element comprises an actuator.

**19.** A razor according to any of claims 14 to 18 wherein said biasing means comprises a coil spring.

**20.** A razor according to any of claims 14 to 19 wherein said returning means comprises a torsion spring.

**21.** A razor according to any of claims 14 to 20 wherein said first axis is substantially parallel to said second axis.

**22.** A razor according to any of claims 14 to 21 wherein the third axis is substantially parallel to at least one of said first axis or said second axis.

**23.** A razor according to any of claims 15 to 22 wherein said second element comprises two engagement arms and said engagement arms move along substantially parallel paths in response to shaving forces exerted on a razor head.

**24.** A razor according to claim 23 wherein said engagement arms remain in a single plane when moving in response to shaving forces exerted on a razor head.

**25.** A shaving system according to claim 2 or any claim dependent therefrom wherein said razor further comprises a cross beam connected to said engagement arms and supported for pivotal and sliding movement relative to said base.

**26.** A shaving system according to claim 2 or any claim dependent therefrom wherein said engagement arms are slidably supported relative to said base for movement along substantially parallel paths.

**27.** A shaving system according to claim 26 wherein said cross beam is supported for pivotal and sliding motion relative to said base.

FIG-1

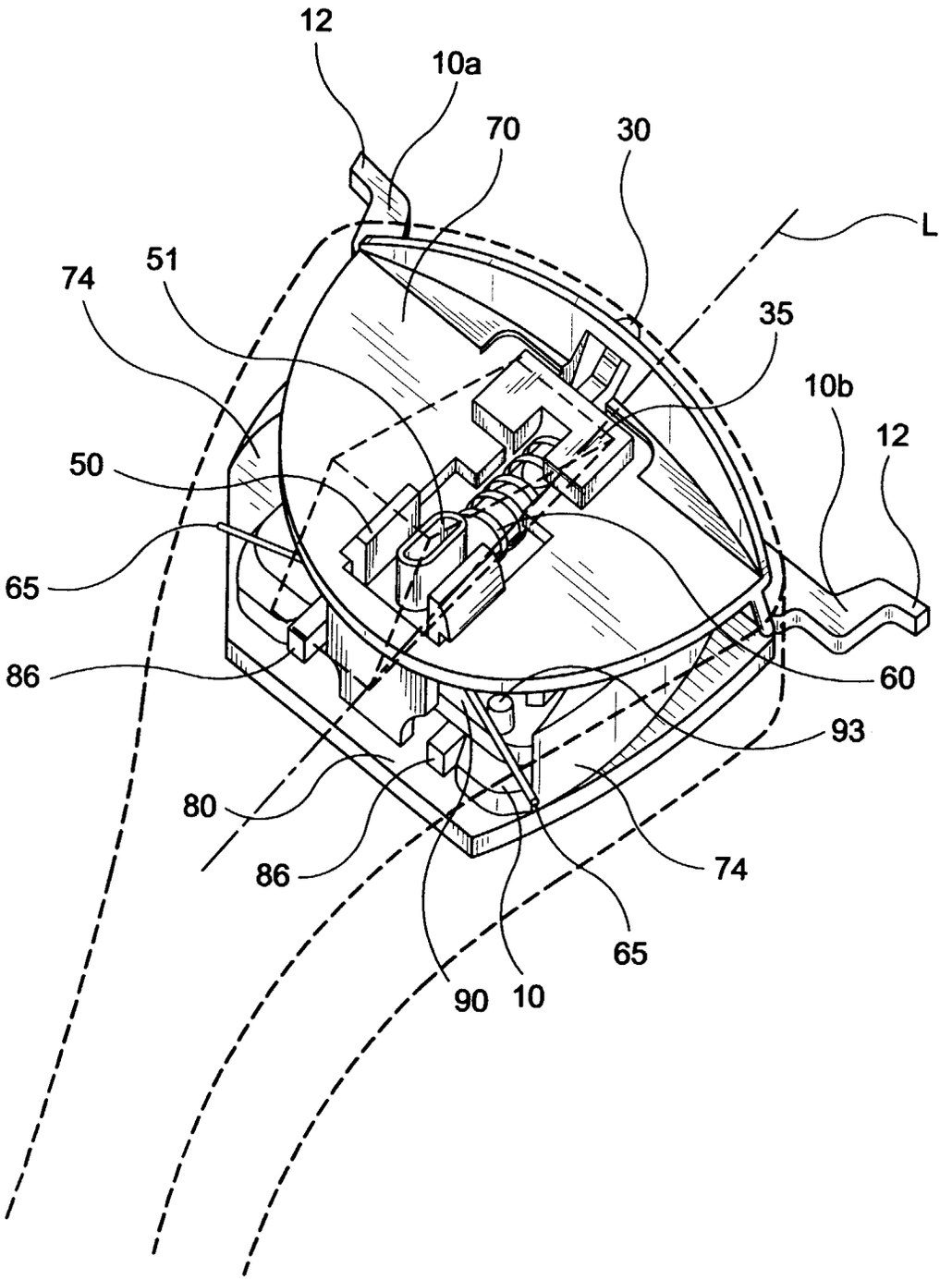


FIG-2A

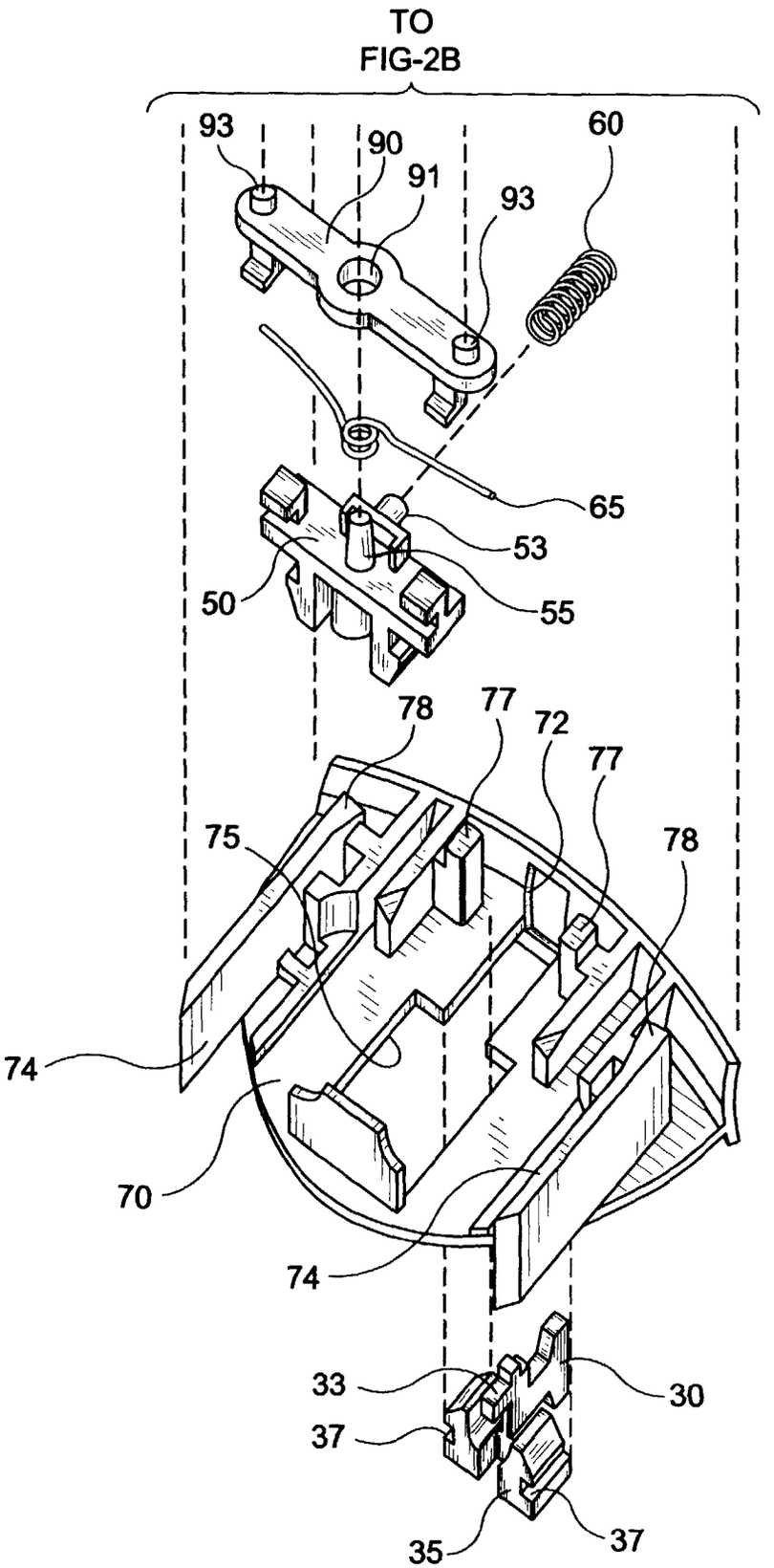
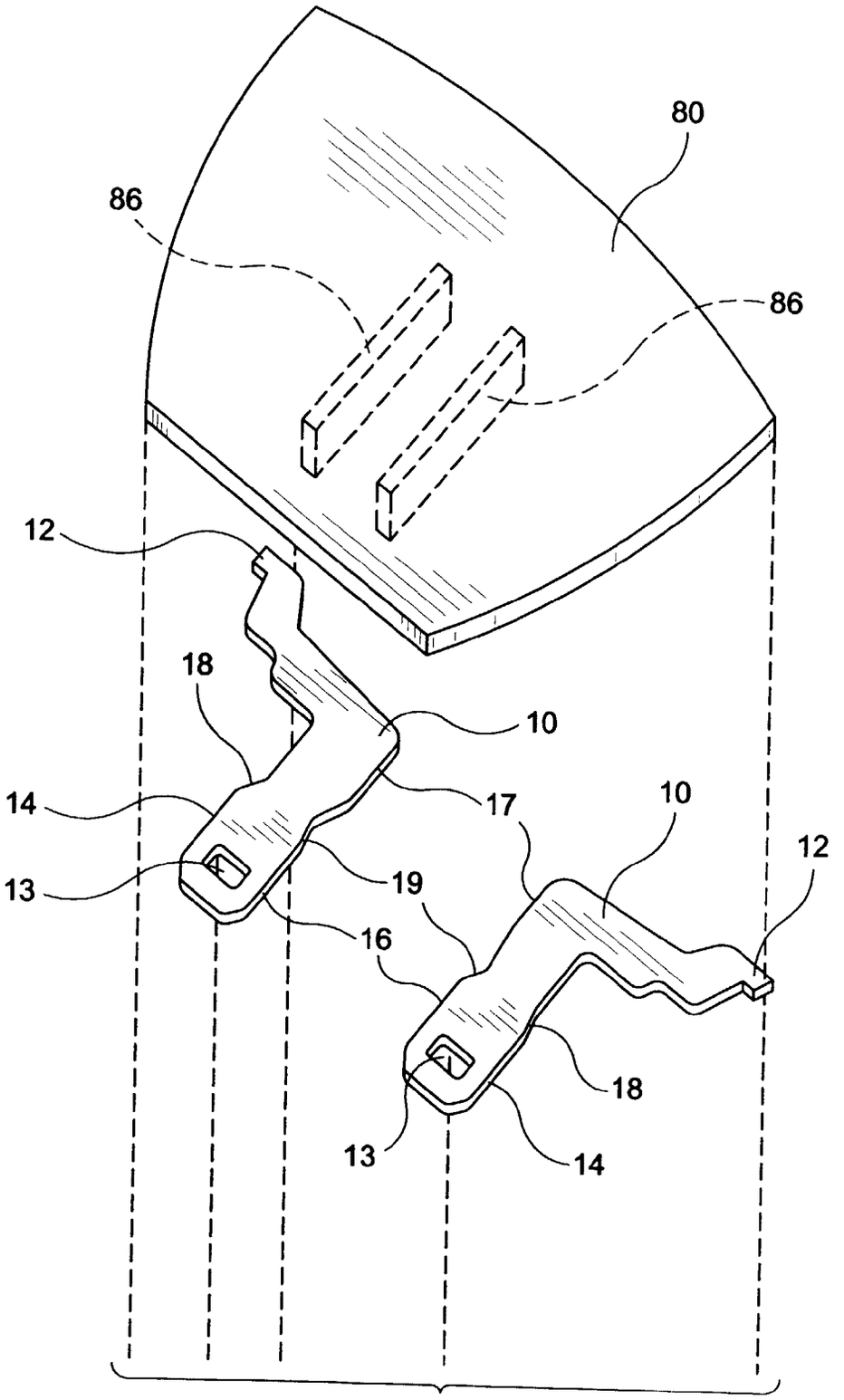

TO
FIG-2B
93
90
91
93
60
65
53
50
55
78
77
72
77
75
78
74
70
74
33
30
37
35
37

FIG-2B




TO
FIG-2A

FIG-3

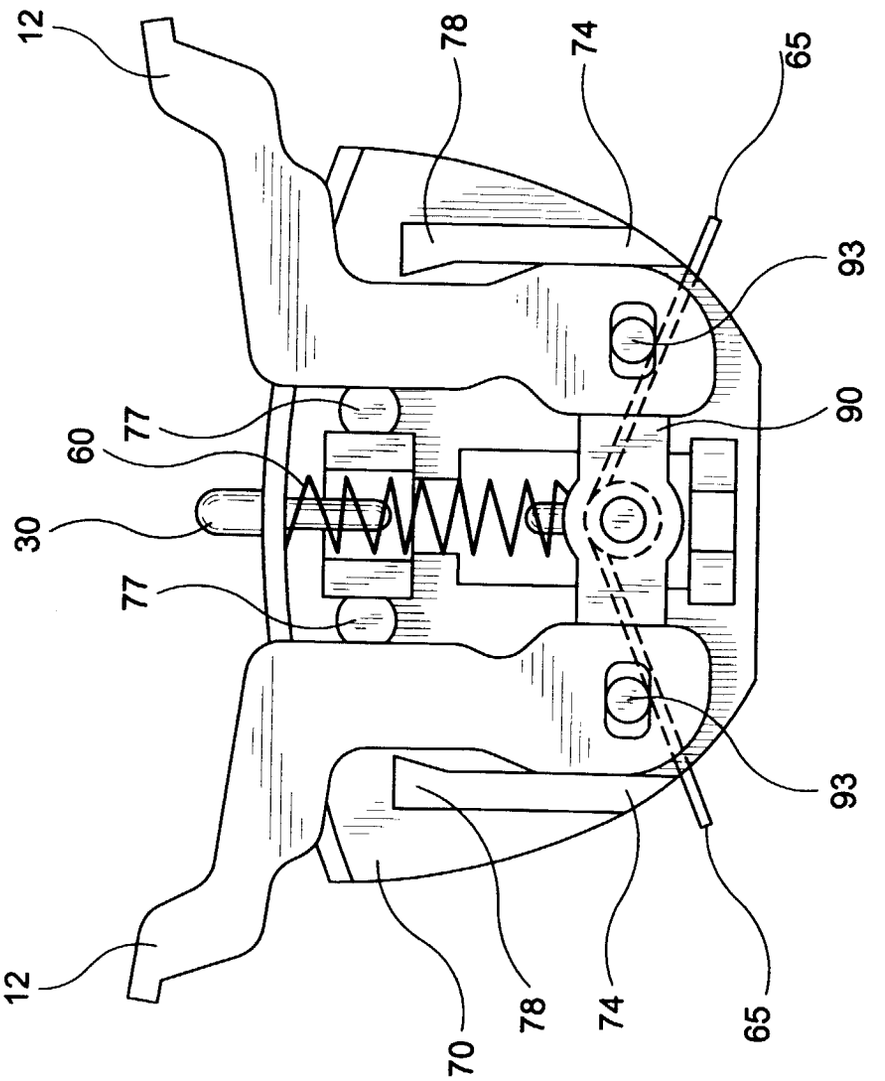


FIG-4

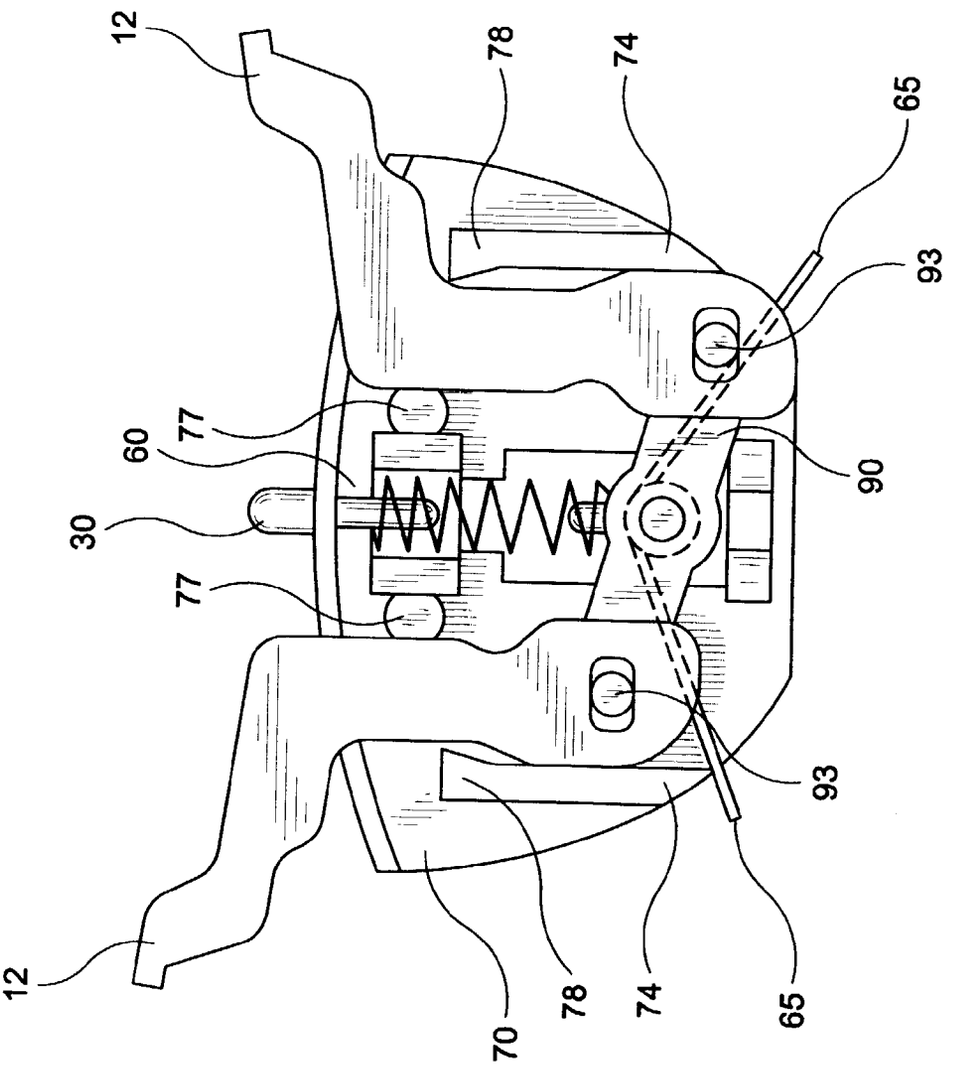
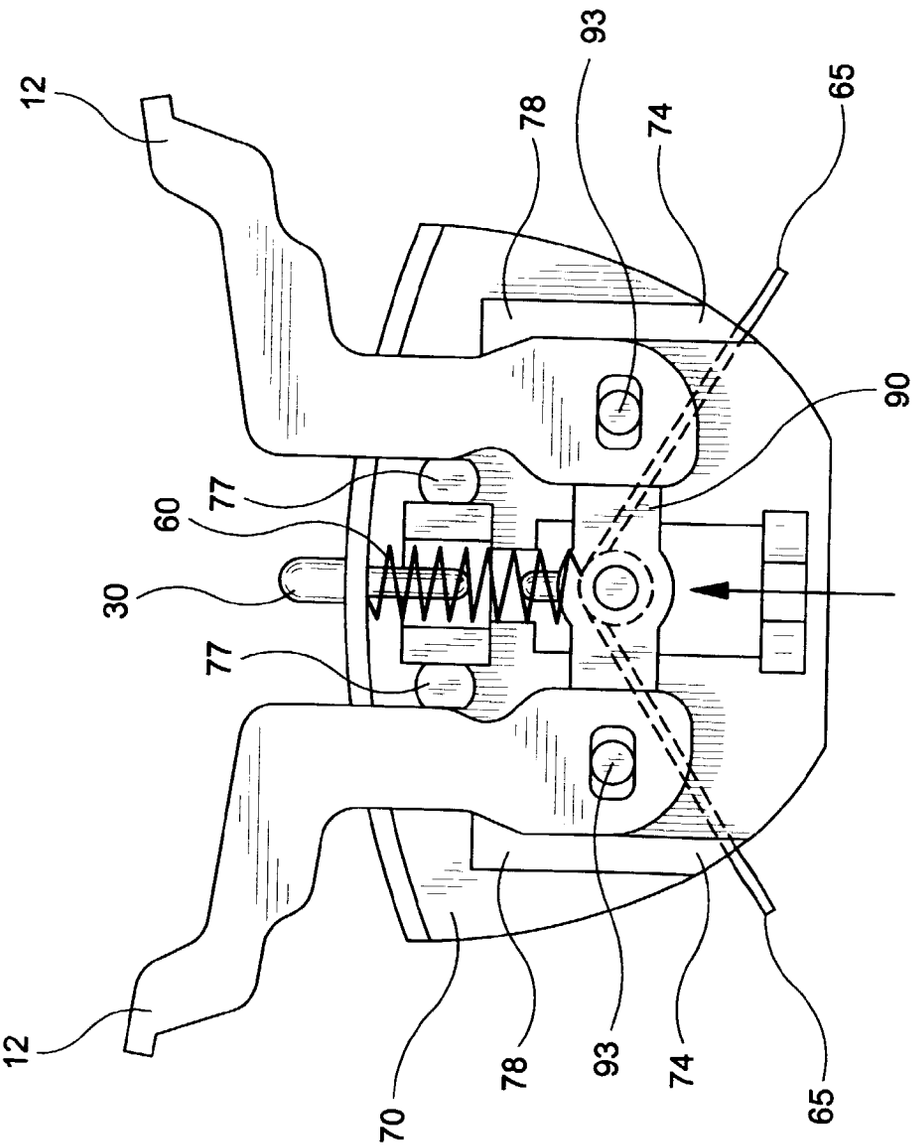


FIG-5



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# EUROPEAN SEARCH REPORT

Application Number
EP 98 30 4199

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) |
|---|---|---|---|
| X | US 4 253 236 A (JACOBSON CHESTER F) 3 March 1981 * the whole document * | 2,15-22 | B26B21/22 |
| A | --- | 1,4 | |
| D,A | US 5 535 518 A (ALTHAUS WOLFGANG) 16 July 1996 * the whole document * | 1,2,4,15 | |
| | --- | | |
| D,A | WO 93 20983 A (GILLETTE CO ;OLDROYD BRIAN (GB)) 28 October 1993 * the whole document * | 1,2,4,15 | |
| | --- | | |
| D,A | GB 2 172 236 A (WILKINSON SWORD LTD) 17 September 1986 * the whole document * | 1,2,4,15 | |
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| D,A | GB 2 116 470 A (GILLETTE CO) 28 September 1983 * the whole document * | 1,2,4,15 | |
| | ----- | | |

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B26B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 17 September 1998 | Herygers, J |

CATEGORY OF CITED DOCUMENTS

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