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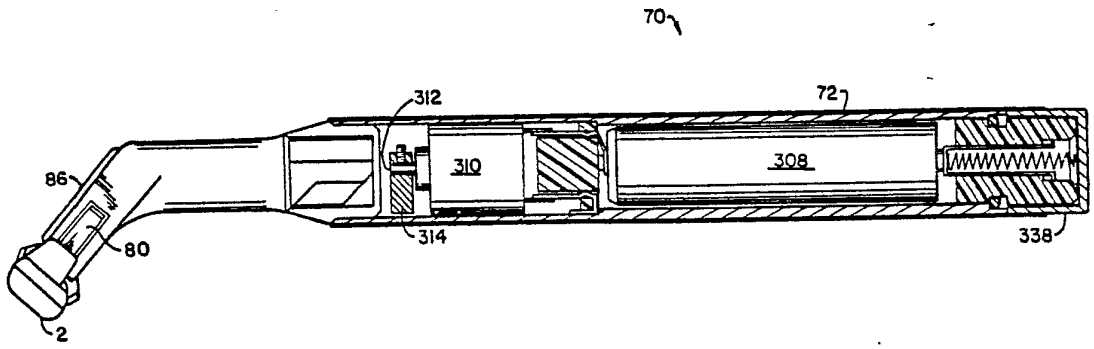

(57) Abstract

A razor assembly including a blade assembly (2) and a handle assembly (70). The blade assembly (2) includes first (28) and second (28) blades independently movable during shaving. The blade (2) and handle (70) assemblies are interconnected such that the blade assembly may move pivotally on the handle during shaving. The handle (70) further includes vibration-inducing means (310, 314) for imparting a vibratory movement to the blade assembly (2).

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A RAZOR ASSEMBLY

BACKGROUND OF THE INVENTION

Field of the Invention

The invention relates to wet shaving implements, and is directed more particularly to a razor assembly which, as a whole, is subject to vibratory movement. Which has disposed therein a blade assembly which is pivotally movable on a handle assembly during a shaving operation, the blade assembly having individual blade assembly components therein which are independently movable during the shaving operation.

Description of the Prior Art

It is known in the art to provide a razor blade assembly which may be connected to, and used in conjunction with, a razor handle to facilitate shaving operations. U.S. Patent No. 3,724,070, issued April 3, 1973, in the name of Francis W. Dorion, Jr. shows a blade assembly in which blade means are held between blade assembly surfaces adapted to engage the surface being shaved in front of and behind, respectively, cutting edge portions of the blade means. Such surfaces are generally referred to as "guard" and "cap".

It is further known that shaving efficiency of such a safety razor assembly may be improved if the blade assembly is adapted to pivot on the razor handle during a shaving operation, permitting the blade assembly to more closely follow the contours of a

surface being shaved. U.S. Patent No. 3,935,639, issued February 3, 1976, in the name of John C. Terry, et al, and U.S. Patent No. 3,938,247, issued February 17, 1976, in the name of Nelson C. Carbonell, et al, are illustrative of razor handles adapted to accept the blade assembly of the '070 patent in such manner as to permit pivotal movement of the blade assembly during a shaving operation. U.S. Patent No. 3,950,849, issued April 20, 1976, in the name of Roger L. Perry, illustrates a modified blade assembly adapted for pivotal movement. U.S. Patent No. 4,026,016, issued May 31, 1977, in the name of Warren I. Nissen, and U.S. Patent No. 4,083,104, issued April 11, 1978, in the name of Warren I. Nissen, illustrate, respectively, a blade assembly and razor handle comprising a shaving system in which the blade assembly pivots on the handle during shaving. The shaving system shown in the '016 and '104 patents has become well known world-wide.

Another means by which increased shaving efficiency may be obtained is that of retaining the blade assembly, as a whole, stationary but permitting movement of individual components thereof in response to forces encountered during shaving. In U.S. Patent No. 4,168,571, issued September 25, 1979, in the name of John F. Francis, there is shown a blade assembly in which the guard, cap and blade means are each movable independently of each other in dynamic fashion. U.S. Patent No. 4,270,268, issued June 2, 1981, in the name of Chester F. Jacobson, shows a blade assembly in which the guard and blade means are independently movable.

In U.S. Patent No. 4,492,024, issued January 8, 1985, in the name of Chester F. Jacobson, there is disclosed a safety razor blade assembly adapted for pivotal movement, as a whole, on a razor handle during a shaving operation, and further having blade means movable within the blade assembly in response

to forces encountered during a shaving operation.

In U.S. Patent No. 4,498,235 issued February 12, 1985, in the name of Chester F. Jacobson, and in U.S. patent application Serial No. 660,950, filed October 15, 1984 in the name of Chester F. Jacobson, and in U.S. patent application Serial No. 660,952, filed October 15, 1984 in the name of Chester F. Jacobson, there are disclosed particular embodiments of razor blade assemblies of the '024 type.

In U.S. Patents 3,648,368 and 3,772,779, issued respectively, on March 14, 1972 and November 20, 1973, both in the names of Paul W. Douglas and Joseph E. Koehler, there are disclosed razors having handle portions in each of which is mounted an electric motor, a shaft rotatable by the motor, and a weight eccentrically mounted on the free end of the shaft, rotation of the shaft operating to cause vibration of the razor, and particularly the head portion thereof, to impart a slicing motion to blade means.

A feature of the present invention is the provision of a safety razor assembly comprising a blade assembly and a handle assembly, means for pivotally interconnecting the blade and handle assemblies such that the blade assembly may move pivotally on the handle assembly during a shaving operation, the blade assembly having two blades therein, each of said blades being mounted for movement independently of each other and of the remainder of the blade assembly during a shaving operation, and the handle assembly having mounted therein means for causing vibration of the entire razor assembly and ocillatory movement of the blade assembly to effect a slicing motion of the two blades.

The above and other features of the invention, including various novel details of construction and combinations of parts, will now be more particularly described with reference to the accompanying drawings and pointed out in the claims. It will be understood

that the particular device embodying the invention is shown by way of illustration only and not as a limitation of the invention. The principles and features of this inyention may be employed in various and numerous embodiments without departing from the scope of the invention.

DESCRIPTION OF THE DRAWINGS

Reference is made to the accompanying drawings in which is shown an illustrative embodiment of the invention from which its novel features and advantages will be apparent.

In the drawings:

Fig. 1 is a top plan view of a housing portion of one form of blade assembly illustrative of an embodiment of the invention;

Fig. 2 is a front elevational view thereof;

Fig. 3 is a top plan view of one form of blade assembly illustrative of an embodiment of the invention;

Fig. 4 is a front elevational view thereof;

Fig. 5 is a sectional view of the blade assembly, taken along the line V-V of Fig. 3;

Fig. 6 is a top plan view of another form of blade assembly illustrative of an alternative embodiment of the invention having a shaving aid incorporated therein;

Fig. 7 is a side elevational view of one form of handle assembly illustrative of an embodiment of the invention;

Fig. 8 is a front elevational view thereof;

Fig. 9 is a back elevational view thereof;

Fig. 10 is a sectional view of the blade assembly attached to the handle assembly, taken generally along the length-wise centerline of the blade assembly with parts broken away for greater clarity; and

Fig. 11 is a sectional view of the razor handle assembly, shown attached to the blade assembly, which is shown in elevation.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, it will be seen that the illustrative razor blade assembly includes a body member 2 having first and second end portions 4, 6 interconnected by front and back wall portions 8, 10. Frame portions 12 extend width-wise of the body member, interconnecting the front and back walls 8, 10.

The back wall portion 10 of the body member 2 has an upper portion 14 which engages skin being shaved behind the cutting means of the assembly, thereby fulfilling the functions and occupying the position of the "cap" portion of conventional razor blade assemblies. Such portion 14 shall, for that reason, be referred to hereinafter as the "cap portion".

Each of the end portions 4, 6 is provided with opposed slots 16 disposed transversely to the frame portions 12. One of the frame portions 12 near the first end portion 4 is provided with a spring finger 18 extending therefrom generally parallel to the front and back walls 8, 10. The finger 18 is provided with an upturned end portion 20 having an upper surface 22. In like manner, another of the frame portions 12 near the second end portion 6 is provided with a spring finger 18' of similar configuration, with upturned end portions 20' having upper surfaces 22'. The fingers 18, 18' extend in opposite directions, the finger 18 extending toward the first end portion 4 of the body member 2 and the finger 18' extending toward the second end portion 6 of the body member. The fingers 18 and 18' are aligned with each other and with a pair of the slots 16. The first end portion 4 is provided with spring fingers 17 extending therefrom inwardly and upwardly of the body member, as viewed in Figs. 1 and 2. Each of the fingers 17 is provided with an upturned end portion 19 having an upper surface 21. In like manner, the second end portion 6 is provided with spring fingers 17' of similar configuration, with upturned end portions 19'

having upper surfaces 21'. The fingers 17, 17' extend in generally opposite directions, the fingers 17 extending from the first end portion 4 generally toward the second end portion 6, and the fingers 17' extending from the second end portion 6 generally toward the first end portion 4. The fingers 17, 17' are each aligned with a pair of the slots 16.

The assembly includes a guard portion 24 (Figs. 3-6) having a slide member 26 at either end thereof. The slide members 26 are received in a pair of opposed slots 16 nearest the front wall portion 8. The bottom of the guard portion rests upon the surfaces 22, 22' of the spring fingers 18, 18'. The lower edges of the slide member 26 rest above the bottoms of their slots 16, allowing the guard portion 24 to be moved further into the slots, against the bias of the spring fingers 18, 18' therebeneath. The spring fingers supporting the guard portion comprise a set of spring fingers, the object of which is to resiliently support the guard portion. In a shaving operation, the guard portion travels over the surface being shaved ahead of the cutting means.

The assembly further includes blade means 28 (Figs. 3, 5 and 6) comprising a blade base portion 30, a cutting edge portion 32 extending from the base portion, and slide portions at either end of the base portion. The slide portions which may be merely extensions of the blade base portion 30, are received in a pair of the opposed slots 16. An underside 34 (Fig. 5) of the blade cutting edge portion 32 is engaged by the surfaces 21, 21' of a pair of the spring fingers 17, 17'. Simultaneously, a surface of the blade base portion 30 is engaged by the rearward surfaces 23, 23' (Figs. 1 and 5) of the finger end portions 19, 19' to urge the blade base portion rearwardly in its slots 16, as shown in Fig. 5. Lower edges of the slide portions are spaced from the bottoms of their slots to permit movement of the blades

further into the slots 16 against the bias of the spring fingers 17, 17' on which the blade base portion rests. The spring fingers supporting the blade base portion 30 comprise another set of spring fingers, the object of which is to resiliently support the blade means thereon and urge the blade means into a secure position within the slots 16.

In the embodiment illustrated, the blade means include a second blade 28' (Fig. 5) having a base portion 30', a cutting edge portion 32', and slide portions, all anchored similarly to the above-described first blade means. The slide portions of the second blade are received in a third pair of the opposed slots 16 nearest the cap portion 14 with the base portion 30' resting upon spring finger surfaces 21, 21'. The spring fingers supporting the second blade comprise still another set of spring fingers, which resiliently support the second blade and urge the second blade into a secure position in the slots 16. In a shaving operation, the second blade travels over the surface being shaved behind the first blade.

The guard portion 24 and first and second blades 28, 28' are clamped in place by spring clamps 40 (Figs. 3-6) which are received in slots 42 (Figs. 1 and 2) in the end portions 4, 6. The clamps 40 engage the guard portion 24 and blades 28, 28' forcing them into slots 16 to a point where a slight stress is placed on the spring fingers.

On the underside of the body member 2 and the frame portions 12, are disposed two extensions 44, 46 having at their free ends, respectively, inwardly extending opposed rails 48, 50, each rail having respective arcuate upper surfaces 52, 54 (Figs. 2 and 4). The extensions comprise a pivot mounting means by which the blade assembly may be removably and pivotally attached to a razor handle. Referring to Figs. 2 and 4, it will be seen that the blade assembly body member underside is

additionally provided with cam means 56 adapted to receive a cam follower operative to urge the blade assembly to a given position.

Referring again to Figs. 2 and 4, it will be seen that the blade assembly rails 48, 50 in conjunction with undersurfaces 94, 96 of the body member 2, and arcuate struts 95, 97, define arcuate slots 98, 100 adapted to receive razor handle shell bearings described herein below. The shell bearings comprise a pivot mounting means adapted to cooperate with the above described blade assembly pivot mounting means to facilitate pivotal connection of the blade assembly to the razor handle assembly.

During a shaving operation, the guard portion 24 and the blades 28, 28' move independently of each other against the bias of the spring fingers. At the same time, the blade-supporting spring fingers keep the base portions of the blades in substantially their assigned planes by urging the blade bases rearwardly. Simultaneously, the blade assembly, as a whole, pivots on the handle, following the contours of the surface being shaved.

In Fig. 6, there is disclosed an embodiment in which one of the guard portion 24 and back wall portion 10 (the latter is illustrated) is provided with a shaving aid 200 of the general type disclosed in U.S. Patents 2,292,418, issued August 11, 1942 to H.E. Wetherbee; and 4,170,821 issued October 16, 1979 to Anthony R. Booth; as well as U.K. Patent 2,024,082, application published January 9, 1980 and patent published May 6, 1982, in the name of Harry Pentney, et al.

The shaving aid 200 is preferably in the form of a body of material fixed to a skin-engaging surface, such as the cap portion 14 shown in Fig. 8 for illustrative purposes.

The shaving aid material preferably comprises a molded, extruded, or otherwise formed mixture of a

hydrophobic material and a water leachable hydrophilic polymeric material such that, during a shaving operation, water present on the area to be shaved leaches out the hydrophilic material which may serve as a lubricant.

Alternatively, one or more of the guard and cap portions 24, 14 may be formed of the shaving aid mixture.

In operation, wetting the surface to be shaved with water prior to shaving causes, during shaving, leaching out of a portion of the water-soluble material which serves to lubricate the shaving surface and reduce friction between the cap and/or guard portions of the blade assembly and the shaving surface. Thus, comfortable and effective shaving can be obtained by simply wetting the shaving area prior to shaving.

Referring to Figs. 7-10, it will be seen that an illustrative embodiment of the invention includes a razor handle assembly 70 having a grip portion 72. One end of the grip portion 72 is provided with a recess 74 (Fig. 7) in which is disposed a molded plastic head portion 76 comprising two arms 78, 80 joined by a connecting portion 82, which may be secured together by pins 83, as illustrated in Fig. 10. The grip portion 72 is further provided with a cover member 86 including a pair of projections 88 (Fig. 10) which are disposed against the connecting portion 82 in a manner securely locking the head portion 76 to the grip portion 72. Each of the arms 78, 80 has disposed on its free end, respectively, a shell bearing 90, 92.

In the handle recess 74, there is disposed a coil spring 102 and a plunger member 104, the spring biasing the plunger in the direction of a free end 106 of the plunger member 104. When the blade assembly is connected to the handle assembly, the free end 106 of the plunger member 104 is urged by the spring 102 into engagement with the blade assembly cam means 56. During pivoting operation of the blade assembly, the

plunger end 106 bears against the cam means 56 to urge the blade assembly to a given position, the position in which the plunger end 106 rests at an apex of the cam means 56.

Referring particularly to Fig. 10, it will be seen that the arms 78, 80 extend beyond the sides of the handle and are accessible to an operator. The arms 78, 80 are biased outwardly by a leaf or wire spring 81 disposed in the head portion 76. To connect the blade assembly to the handle assembly, the operator presses the arms 78, 80 inwardly, toward each other, against the bias of the spring 81, moving the shell bearings 90, 92 toward each other.

The plunger member 104 is provided with oppositely extending arms 107, 108 (Fig. 10), each having upstanding therefrom a detent 110, 112. Each of the shell bearings 90, 92 is provided with an opening 114, 116 adapted to receive, respectively, the detents 110, 112. As the shell bearings 90, 92 are pressed inwardly toward one another, the openings 114, 116 align with the detents 110, 112, respectively. Upon such alignment, the spring 102 urges the plunger member 104, and thereby the detents 110, 112 upwardly, as viewed in Fig. 10, such that the detents 110, 112 enter the openings 114, 116, to lock the arms 78, 80 in an inwardly-flexed position. Upon release of the arms 78, 80 by the operator, the arms remain locked in the inwardly-flexed position.

The shell bearings 90, 92 are then pressed against the blade assembly underside arcuate struts 95, 97, forcing the plunger member 104 downwardly, as viewed in Fig. 10 and removing the detents 110, 112 from the openings 114, 116, the arms 78, 80 being thereby released. Upon release of the arms 78, 80, the arms spring outwardly in opposite directions away from each other, under the influence of the spring 81, the shell bearings 90, 92 entering the arcuate slots 98, 100.

The spring biased plunger member 104 engages the cam means 56, seeking the apex of the cam means and thereby urging the blade assembly to a "neutral" position.

During a shaving operation, the guard portion 24 and the blades 28, 28' move independently of each other against the bias of the spring fingers 18, 18'. Simultaneously, the blade assembly, as a whole, pivots on the handle, following the contours of the surface being shaved.

When it is desired to discard a used blade assembly, the operator need only compress the arms 78, 80, removing the shell bearings 90, 92 from the arcuate slots 98, 100 and releasing the blade assembly.

Disposed in the handle assembly 70 is a battery 308 and an electric motor 310 (Fig. 11). Extending from the motor 310 in the direction of the head portion of the razor is a rotatable shaft 312 on the free end of which is disposed a weight 314. The weight 314 is mounted eccentrically on the shaft so that the center of gravity of the weight is removed from the axis of rotation of the weight. Illustrated in Fig. 11 is a flywheel type weight, mounted such that its center of gravity is removed from the axis of rotation of the shaft 312. Also disposed in the handle member is a switch means 318.

The switch 318 is mounted for rotative motion and may be rotated by movement of an end piece 338, as by a thumb or finger of an operator.

In operation, an operator rotates the switch 318. Electrical energy from the battery 308 is directed to the motor 310. Energization of the motor 310 causes rotation of the shaft 312 and thereby rotation of the eccentrically mounted or unbalanced weight 314. The eccentricity of the weight mounting i.e., the displacement of the center of gravity of the weight from the axis of rotation of the weight, and the disposition of the weight proximate the head portion induces

vibration of the head portion and therefore the blade. Such vibration imparts an oscillating slicing motion to the blades 28, 28' whereby to facilitate ease of cutting.

It is to be understood that the present invention is by no means limited to the particular construction herein disclosed and/or shown in the drawings, but also comprises any modifications or equivalents within the scope of the disclosure. For example, it is preferable under certain conditions that the guard portion be immovable. An alternative embodiment includes a guard portion fixed immovably to the blade assembly body member, but in all other respects structured and operated in accordance with the above description. As a further example, the blade means may include a single blade, rather than the two blade arrangement described, the single blade being used in conjunction with either a movable or stationary guard portion. Still further, while the blade means is shown in the drawings, particularly Fig. 5, as a single piece of metal, bent to form the base and cutter portions, an alternative is to provide a bent support member with a thin blade connected thereto, as is known in the art.

C L A I M S

1. A razor assembly comprising a razor blade assembly and a razor handle assembly, said razor blade assembly comprising first and second blades mounted for individual movement independently of each other and independently of the remainder of said razor blade assembly during a shaving operation, said razor blade assembly and said razor handle assembly having complementary pivot mounting means thereon for pivotally mounting said razor blade assembly on said razor handle assembly such that said razor blade assembly may pivot on said razor handle assembly during a shaving operation, said razor blade assembly having cam means thereon and said razor handle assembly having a spring-biased plunger therein operable to engage said cam means to bias said razor blade assembly on said pivot mounting means to a neutral position, said razor handle assembly further having vibration-inducing means therein for causing vibration of said razor blade assembly.

2. The razor assembly in accordance with claim 1, and further comprising a shaving aid fixed to said razor blade assembly, said shaving aid being formed of a hydrophobic material and water leachable hydrophilic polymeric material.

3. The razor assembly in accordance with claims 1 or 2, in which said razor blade assembly includes guard means, said guard means being mounted on said razor blade assembly for individual movement independently of said blade means and independently of the remainder of said razor blade assembly during a shaving operation.

4. A razor assembly comprising a razor blade assembly and a handle assembly, said razor blade assembly comprising a body member having first and second end portions interconnected by front and back portions, first and second frame portions interconnecting said front and back portions, said end portions having therein opposed slots, a first pair of

spring fingers extending outwardly from said frame portions parallel to said front and back portions and in opposite directions, said fingers being aligned with a first pair of said slots, a second pair of spring fingers extending inwardly from said end portions, and in generally opposite directions toward one another, said second pair of spring fingers being aligned with a second pair of said slots, a third pair of spring fingers extending inwardly from said end portions, and in generally opposite directions toward one another, said third pair of spring fingers being aligned with a third pair of said slots, a guard portion mounted on said first pair of spring fingers and disposed in said first pair of slots, and first and second blade members having, respectively, first and second cutting edges parallel with each other and facing a same direction to act in tandem upon a surface being shaved, said blade members being disposed in said second and third pairs of slots, respectively, and resting upon said second and third pairs of spring fingers, respectively, said first and second blade members and said guard portions each being independently movable relative to the body member in response to forces encountered during a shaving operation by flexure of said spring fingers, the blade assembly having pivot mounting means thereon for pivotal attachment to said razor handle assembly, whereby the blade assembly, as a whole, is pivotally movable on said handle assembly in response to forces encountered during the shaving operation, and cam means disposed on an underside of said body member and adapted to receive a plunger mounted on said razor handle to maintain maximum contact between said surface being shaved and said independently movable first and second blade members and said guard portion, said razor handle assembly comprising a grip portion, a head portion at one end of said grip portion, the head portion having first and second arms movable toward and away from each other, a first shell bearing mounted on

said first arm and a second shell bearing mounted on said second arm, said shell bearings being adapted to receive said razor blade assembly and to permit pivotal movement of said razor blade assembly on said handle assembly, said plunger being spring-biased and disposed in said head portion and extending between said first and second shell bearings, said plunger being reciprocally movable in said head portion, a free end of said plunger being adapted to engage said cam means of said blade assembly to exercise a bias on said blade assembly and thereby urge said blade assembly to a given position on said shell bearings, and means disposed in said handle for causing vibration of said blade assembly, said vibration causing means comprising a motor, a shaft extending from said motor towards said blade assembly, and a weight eccentrically mounted on the free end of said shaft, whereby rotation of said weight by said motor causes vibration of said blade assembly.

5. The razor assembly in accordance with claim 4, and further comprising, in said blade assembly, a shaving aid fixed to one of said back and guard portions, said shaving aid being formed of a hydrophobic material and water leachable hydrophilic polymeric material.

6. The razor assembly in accordance with claim 4, in which said blade assembly comprises blade means having a base portion and a cutter portion, the base and cutter portions being disposed at an abtuse angle to each other, and said spring finger blade support means comprises a finger molded integrally with said body member, said finger engaging an underside of said cutter portion and a side of said base portion, said blade means being disposed in said slots in said end portions of said body member, said finger exercising a bias against said cutter portion underside and simultaneously a bias against said base portion side.

7. The razor assembly in accordance with claim 6, in which said blade assembly includes clip means for retaining

said blade means in said slots, said finger urging said blade means against said clip means and simultaneously urging said blade means rearwardly in said slots.

8. The razor assembly in accordance with claim 4, including in the handle assembly a leaf spring member exercising a bias on said arms in directions outwardly from each other.

9. The razor assembly in accordance with claim 8, including extensions protruding outwardly from said plunger, a detent upstanding from each of said extensions, each of said shell bearings having an opening therein adapted to receive, respectively, said detents, said spring being adapted to urge said detents into said openings when said arms are moved toward each other, to lock said arms in close proximity to each other, engagement of said plunger with said blade assembly being operative to remove said detents from said openings to permit said arms to move away from each other and said shell bearings to engage said blade assembly.

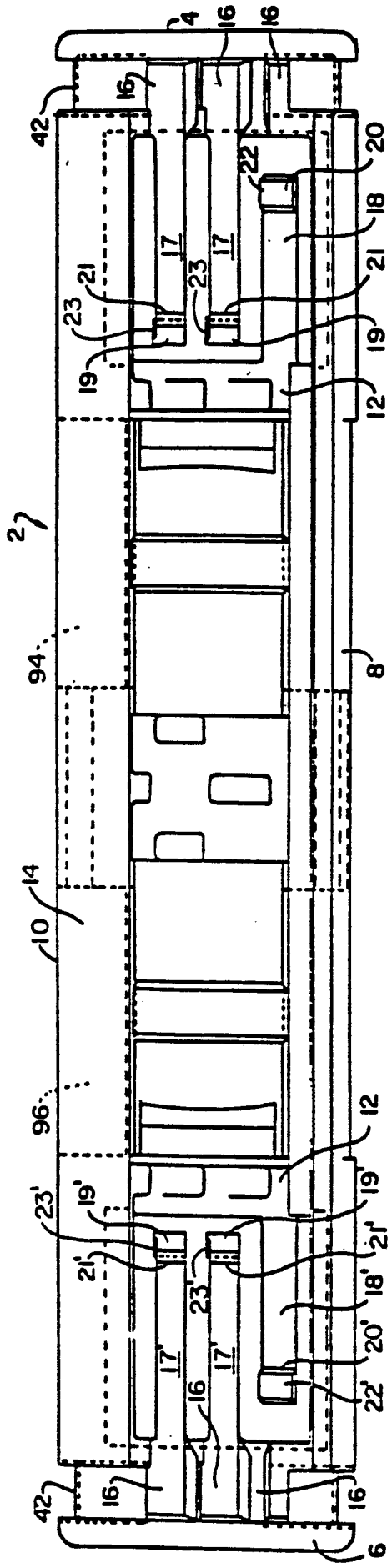
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FIG. 1

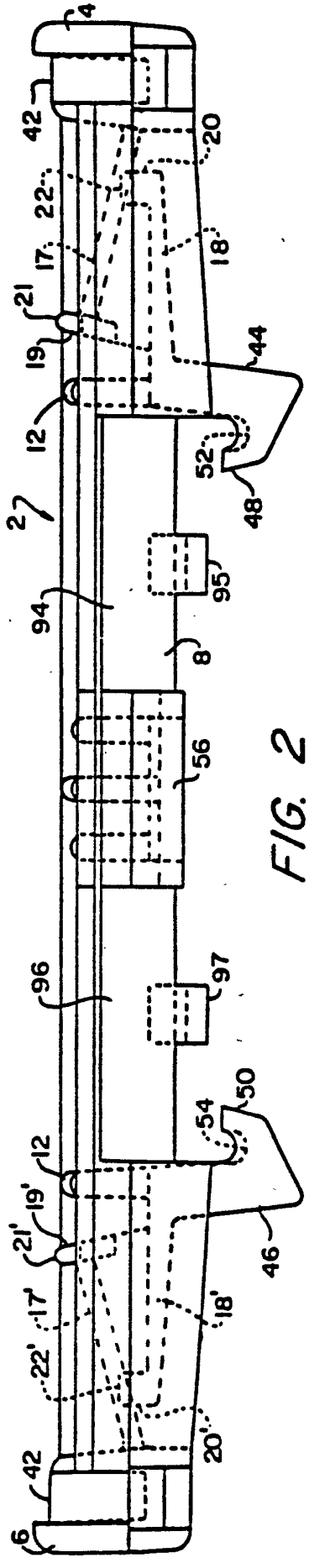
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FIG. 2

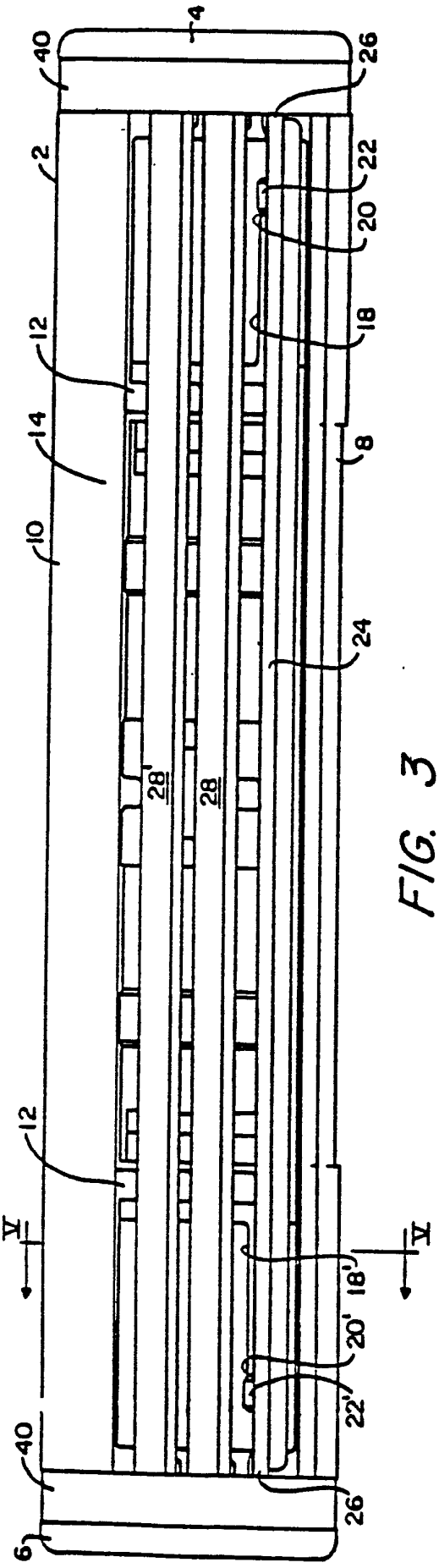
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FIG. 3

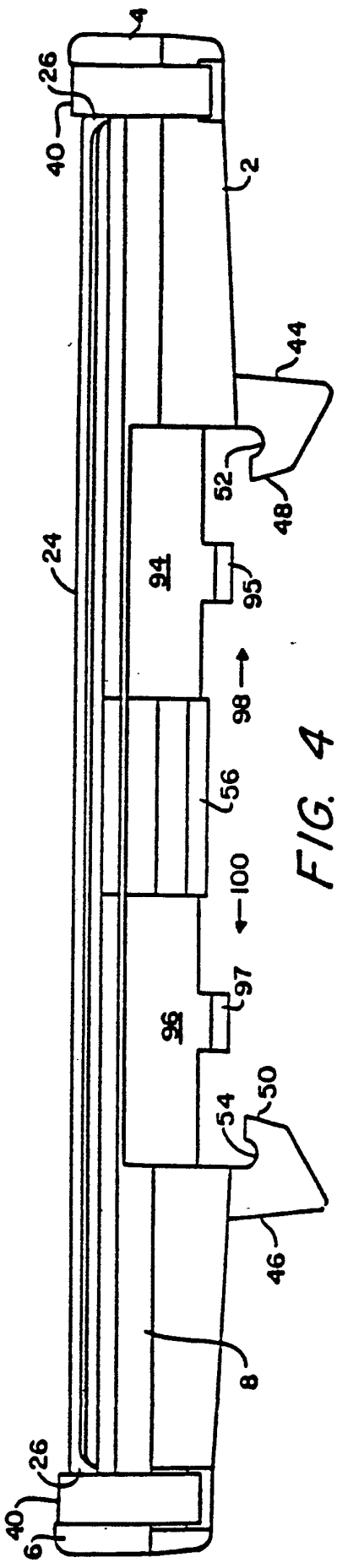
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FIG. 4

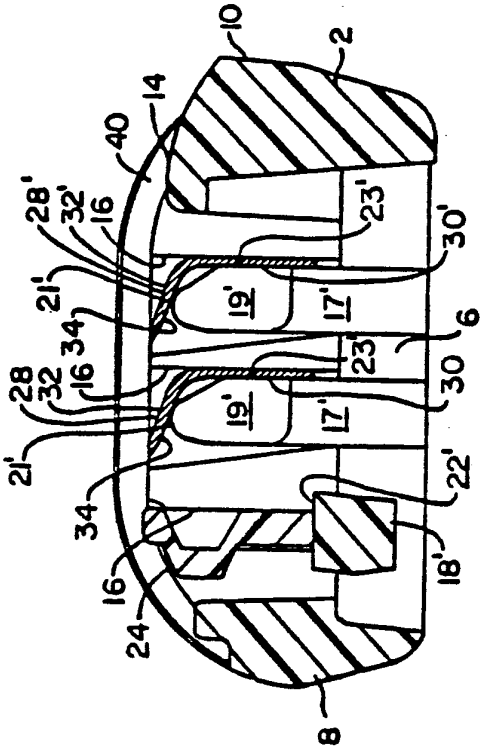
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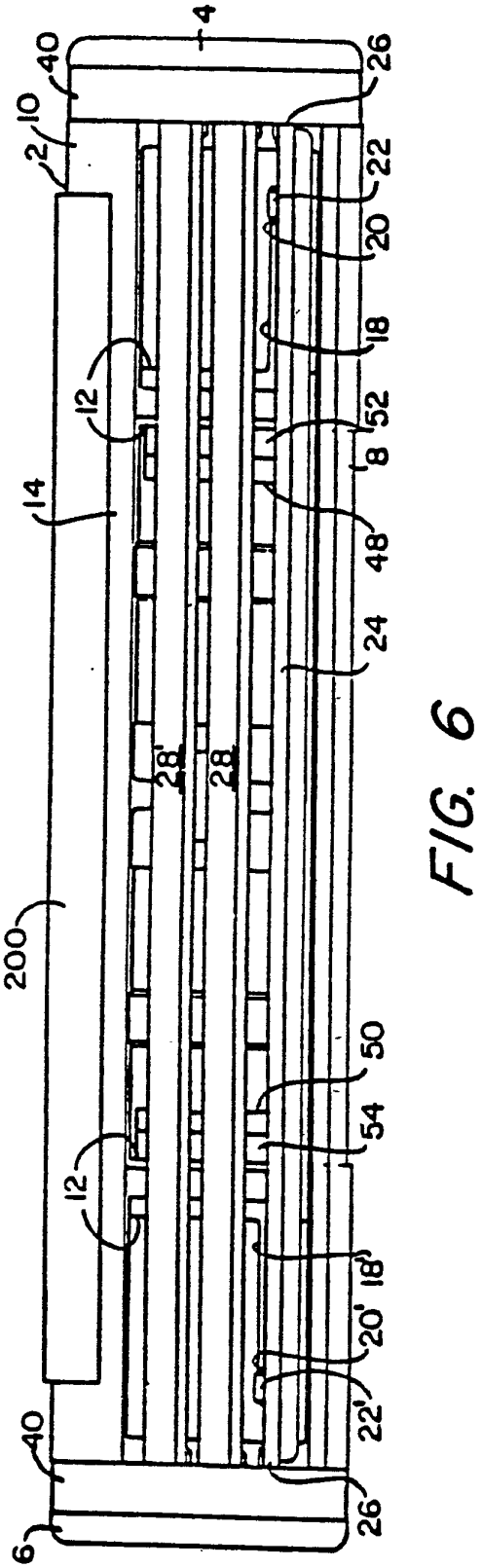
FIG. 5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8
48
24
28'
28
50
54
18'
20'
22'
26

FIG. 6

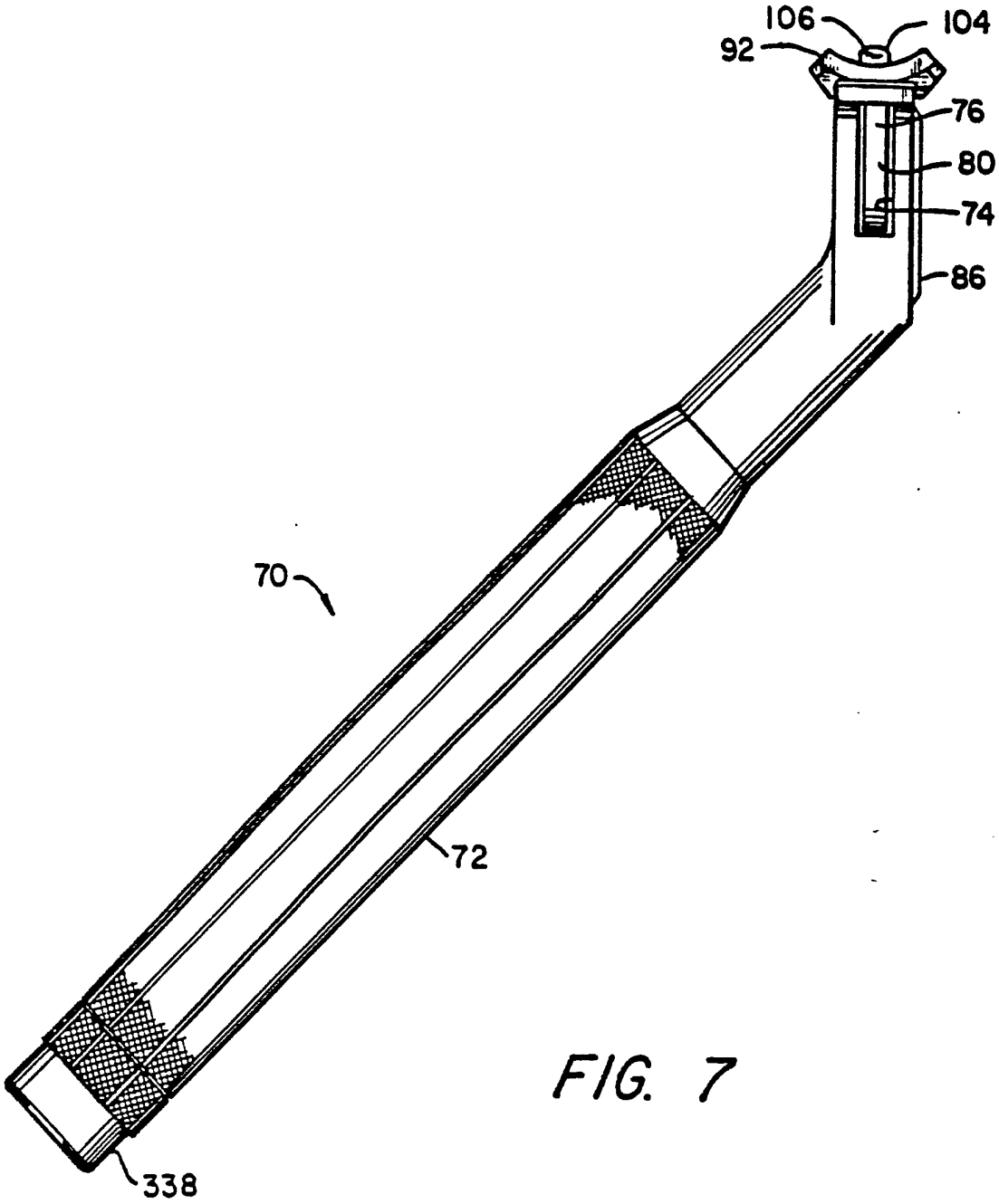


FIG. 7

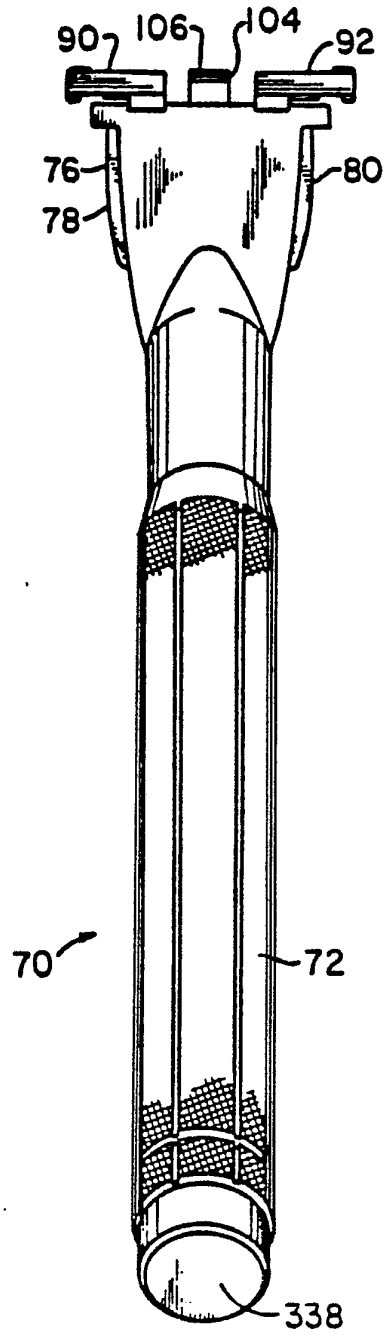


FIG. 8

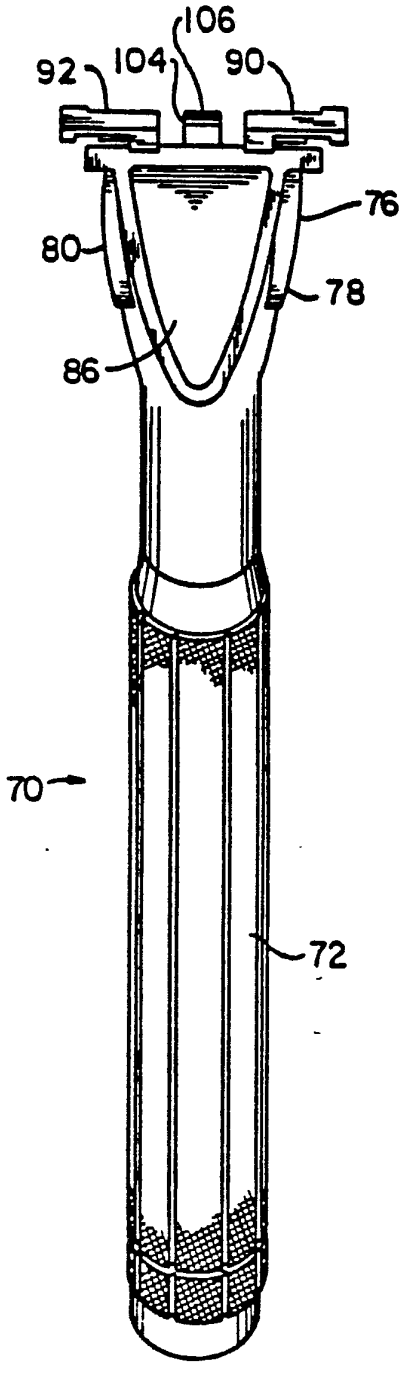
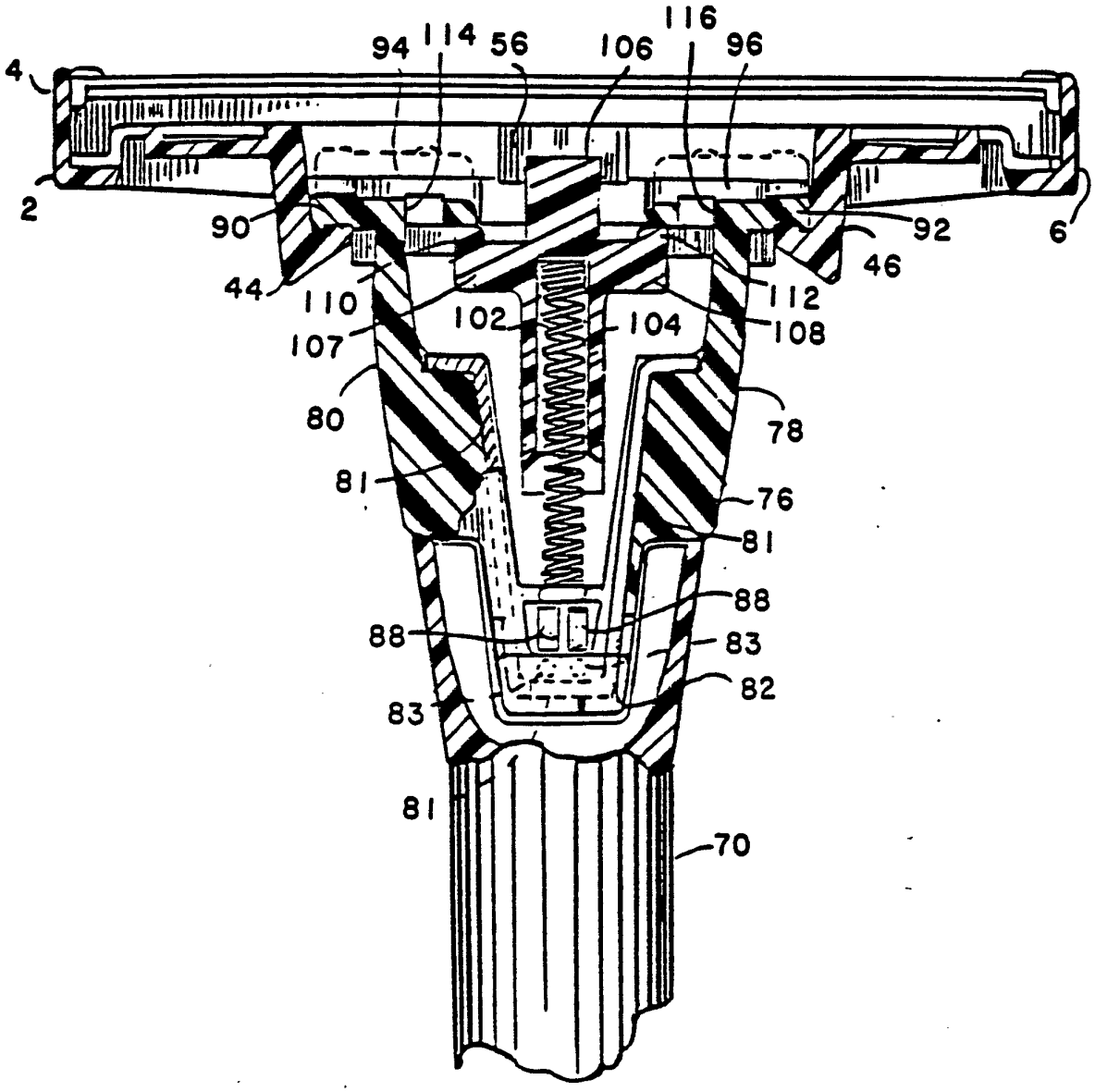


FIG. 9


116
94
114
56
106
96
4
2
90
92
6
46
44
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112
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107
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78
81
76
81
88
88
83
82
83
81
70

FIG. 10

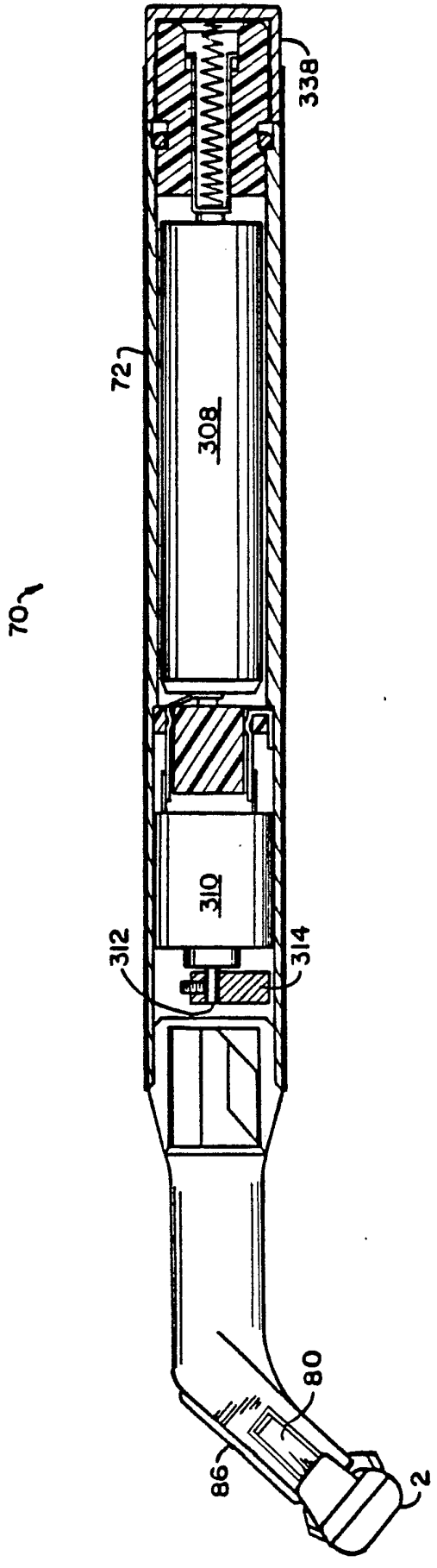

FIG. 11

INTERNATIONAL SEARCH REPORT

International Application No PCT/US86/01329

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl(4). B26B 21/06

U.S. Cl. 30/41

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	30/41, 45, 57

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
Y	US, A, 4,488,357 Published 18 December 1984 Jacobson (entire document)	1-9
Y	US, A, 3,611,568 Published 12 October 1971 Alexander et al. (entire document.)	1-9
Y	US, A, 4,170,821 Published 16 October 1979 Booth (entire document.)	2,3 and 5

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
05 August 1986	02 SEP 1986
International Searching Authority [1]	**Signature of Authorized Officer [20]**
ISA/US	J.C. Peters J.C. Peters

Form PCT/ISA/210 (second sheet) (October 1981)