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(71) Applicant : **WARNER-LAMBERT COMPANY**
201 Tabor Road
Morris Plains New Jersey 07950 (US)

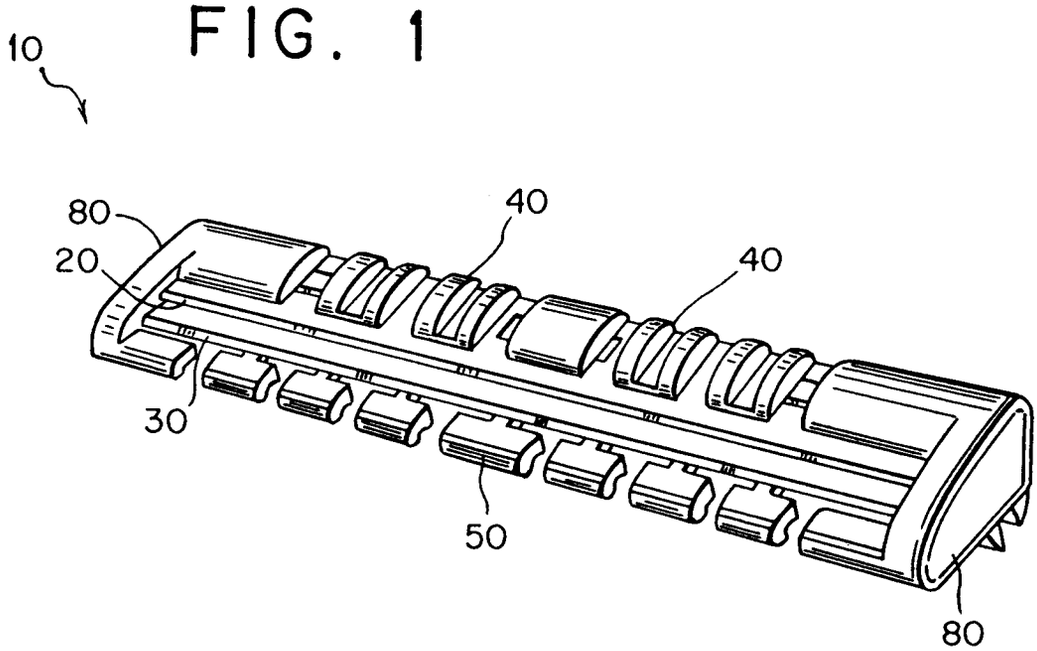
(72) Inventor : **Chen, Evan N.**
879 Riverside Drive
Fairfield, Connecticut 06430 (US)
Inventor : **Butlin, Edward S.**
6391 Downhill Drive
Erie, Pennsylvania 16505 (US)
Inventor : **Butlin, C. Edward**
1304 Hardscrabble Boulevard
Erie, Pennsylvania 16505 (US)

(74) Representative : **Coxon, Philip et al**
Eric Potter & Clarkson St. Mary's Court St. Mary's Gate
Nottingham NG1 1LE (GB)

(54) One-piece flexible razor head.

(57) An integrally formed flexible razor head (10) having a plurality of blade platforms (70) separated by a corrugation (60), at least one blade (20 or 30) having a cutting edge (21 or 31), and a plurality of blade retainers (40) which are integrally formed with the blade platforms (70) and extend to positions above and adjacent to the top surface of the blade (20,30). While the blade retainers (40) are integrally formed with the other pieces of the flexible razor head (10), each blade retainer (40) is discrete with respect to other blade retainers (40).

FIG. 1



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The present invention is directed to a flexible razor head and, more particularly, to a one-piece, integrally formed, flexible razor head.

Razor heads which are flexible along their longitudinal axes have been disclosed in the art. Many of these razor heads require the assembly of several separate pieces such as a cap, a spacer, one or more blades and a blade platform. This assembly process is time consuming and costly. Furthermore, the requirement that these pieces are manipulated, either manually or automatically, is generally considered to place restrictions on the type of materials which may be used in their manufacture. The materials used must be substantially rigid to withstand the assembly process while meeting the specification tolerances necessary to properly join with the other pieces. It would, therefore, be desirable to provide a flexible razor head having integrally formed elements which would therefore eliminate the need for the assembly of a number of elements.

A preferred embodiment of the present invention provides a flexible razor head comprising at least one blade having a cutting edge; a blade support comprising at least two blade platforms and at least one corrugation disposed between two of said blade platforms; and a plurality of discrete blade retainers integrally formed with said blade support and disposed above and adjacent to said blade. While the blade retainers are integrally formed with the other pieces of the flexible razor head, each blade retainer is discrete with respect to other blade retainers. The integrally formed flexible razor head of the present invention, therefore, does not have a continuous cap member commonly found in commercially available razor heads.

Preferably the flexible razor head comprises at least three blade retainers and more preferably the razor head comprises at least seven blade platforms with a corrugation between adjoining blade platforms and at least seven discrete blade retainers each integrally formed with one of said blade platforms.

The razor head may comprise an upper blade and a lower blade wherein said blades are separated by at least one spacer which is integrally formed with said blade support. Each of the blade retainers is separated by a discrete spacer.

The lower blade comprises a lower securing hole, said upper blade comprises an upper securing hole positioned substantially above said lower securing hole, and said flexible razor head further comprises a securing member extending through said lower securing hole and said upper securing hole and wherein said securing member is integrally formed with a blade platform and a blade retainer. The lower securing hole is substantially centrally located in said lower blade.

The lower blade is directly affixed to a plurality of blade platforms. The lower blade comprises a first positioning hole arid a second positioning and said first positioning hole is larger than said second positioning hole and the lower blade is attached to a platform member with a securing member which extends through said first positioning hole.

A plurality of guard members are disposed forwardly of said cutting edge and integrally formed with said blade support and the guard members are each supported by a guard support, each of said guard supports being integrally formed with one of said blade platforms.

The razor head comprises means for attaching it to a razor, the means comprising two slots integrally formed in the bottom of said blade support and adapted to receive an outwardly biased attachment member of a razor. The attachment means further comprises an attachment neck which extends lower than the guard supports.

The invention will now be described in detail with reference to the accompanying drawings in which:-

Figure 1 is a perspective view of a flexible razor head according to a preferred embodiment of the present invention.

Figure 2 is a side view of the razor head shown in Figure 1.

Figure 3 is a top, perspective view of the razor head shown in Figure 1.

Figure 4 is a front view of the razor head shown in Figure 1.

Figure 5 is a rear view of the razor head shown in Figure 1.

Figure 6 is a bottom, perspective view of the razor head shown in Figure 1.

Figure 7 is a top view of a bottom blade of the razor head illustrated in Figure 1.

Figure 8 is a top view of an upper blade of the razor head shown in Figure 1.

Figure 9 is a sectional view taken along lines 9-9 of Figure 3.

Figure 10 is a cross-sectional view taken along lines 10-10 of Figure 3.

Figure 11 is a cross-sectional view along line 11-11 of Figure 6.

Figure 12 is a cross-sectional view of the upper portion of a razor head according to an alternative embodiment of the present invention illustrating a shaving aid receptacle.

Figure 13 is a cross-sectional view illustrating the positioning of a shaving aid according to the alternative embodiment of the present invention.

Figure 14 is a sectional view with portions removed illustrating the positioning of a shaving aid on a blade retainer according to the alternative embodiment of the present invention.

The present invention comprises an integrally-molded, flexible razor head wherein all elements, except the blade or blades, are formed as a single piece. The integral formation of the present flexible

razor head eliminates the time consuming and costly assembly steps necessary in the manufacture of flexible razor heads formed of separate pieces. As described in further detail below, the flexible razor head of the present invention also provides controlled shaving geometry without the use of a continuous cap found in most commercially available razor heads. As used herein, the term "razor head" is meant to include cartridges which are manufactured and typically marketed separate from razors, as well as disposable razors which are formed with a handle and do not require the attachment of separate pieces by the consumer.

Figure 1 illustrates one preferred embodiment of the present invention wherein the flexible razor head 10 comprises an upper blade 20, a lower blade 30, a plurality of discrete retaining members 40, guard members 50, and side supports 80. Figure 2 is a side view of the flexible razor head illustrated in Figure 1 showing the side portion of side supports 80, as well as a side view of attachment neck 90.

The spacing between the discrete retaining members 40 is shown in Figure 3, which is a perspective, top view of the embodiment of the present invention illustrated in Figure 1. This top view also provides a clearer view of the relative positioning of cutting edges 21, 31 of upper blade 20 and lower blade 30, respectively. The blade retainers 40 extend to positions above and adjacent to the top surface of the upper blade 20. Blade retainers 40 overlap upper blade 20, preferably extending at least about 50% and most preferably about 70% to about 90% of the distance from the rear edge of upper blade 20 to cutting edge 21. The retainer members 40 which are integrally formed with blade platform 70 and spacer 100 thereby maintain the vertical positioning of the blades.

According to one preferred embodiment illustrated in Figures 1 to 10, blade retainers 40 are discretely formed without connections and therefore do not form a single, unitary cap member found in many commercially available razor heads. As illustrated in Figure 3, the two end blade retainers 40 are connected to respective side supports 80 via molded connecting member 83. Connecting members 83 are designed to minimize the risk of exposure of either or both of the blades if the razor head 10 is misused by a person applying an outward, lateral force to side supports 80.

As shown in the illustrated embodiment, side supports 80 comprise upper side retainers 81 and lower guard portions 82. Upper side portions 81 are located above and adjacent to the upper blade 20 to retain the upper blade against the spacers 100 and also to control the blade geometry along the side portions of the flexible razor head 10. Those skilled in the art will also appreciate that lower guard portions 82 cover the forward corners of lower blade 30 while also serving as a guard member to control the blade geometry. The bottom of lower blade 30 is supported by a plurality of blade platforms 70 which are integrally formed with corrugations 60 and each preferably have a substantially planar upper portion 76 adjacent to lower blade 30.

As shown in Figures 9 and 10, a spacer 100 is preferably provided between upper blade 20 and lower blade 30 proximate each retaining member 40. The spacer 100 is preferably positioned substantially centrally with respect to the width of the corresponding blade retainer 40 and blade platform 70. Those skilled in the art will appreciate that the ability to flush shaving debris from the space between the blades is enhanced by designing each spacer 100 to have a width less than the corresponding widths of blade spacer 40 and blade platform 70. Spacer 100 maintains a predetermined space, for example about 0.2 inches, between lower blade 30 and upper blade 20. As shown more clearly in Figure 11, spacer 100 is integrally formed with blade retainer 40. A discrete spacer 100 may be provided for each blade retainer 40.

In order to increase the flexibility of the blade support, flexible razor head 10 is provided with corrugations 60 between adjoining blade platforms 70. The corrugations are integrally formed with retainer members 40. The positioning of corrugations 60 on both sides of a blade platform 70 is shown in Figure 10 which is a cross-sectional view along lines 10-10 of Figure 3. Corrugations 60 may be formed in a generally U-shape with a rounded lower portion or may be formed with two vertical side portions and a lower horizontal segment connecting the vertical side walls. Other shapes are possible without departing from the scope of the present invention. Corrugations 60 allow relative movement between neighbouring blade platforms 70 during the flexing of flexible razor head 10. The use of discrete blade platforms 70 connected by a corrugation 60 minimize the potential for separation between the upper supporting surface of blade platform 70 and the bottom of lower blade 30. In this manner, the correct blade geometry is maintained at each point along the flexible razor head 10 even during flexing which occurs during shaving.

As used herein, the term "corrugation" is meant to include a resilient connector disposed between adjoining blade platforms and having a length greater than the "normal" distance between those adjoining blade platforms, i.e. the gap existing when the flexible razor head is in a substantially linear configuration and is not subject to external forces such as those encountered during shaving. The corrugations of the present invention are longer than the "normal" distance and are preferably at least about 20% longer than the normal distance. Furthermore, the corrugations may be formed with sidewalls having sections with different thicknesses in order to further increase the flexibility of the blade support.

A guard support 55 depends downwardly and forwardly from each blade platform 70 in the illustrated preferred embodiment. As illustrated more clearly in the bottom view of Figure 6, each guard support 55 extends from a rearward position between corrugations 60 to a position forward of cutting edge 31 to support guard members 50. Those skilled in the art will appreciate that discrete guard members 50 provide a function similar to a continuous guard bar in providing a suitable blade geometry to the flexible shaving head 10 of the present invention, while providing greater flexibility than a conventional continuous guard bar formed of the same materials.

Figures 7 and 8 illustrate an upper blade 20 and a lower blade 30, respectively, used in the illustrated embodiment of the present invention. Both upper blade 20 and lower blade 30 comprise a forward cutting edge 21, 31 and side positioning slots 23, 33 and 24, 34. As illustrated, left side slots 23, 33 may be formed with a shape different from right side slots 24, 34 in order to ensure proper positioning within a mold cavity. Each blade is also preferably provided with a generally centrally located hole 25, 35. As illustrated in Figure 3, a securing member 105, which is integrally formed with central blade retainer 40 and central blade platform 70, passes through both of these centrally located holes 25, 35. In the illustrated preferred embodiment of the present invention, these central holes 25 35 are the only positions where a securing member passes entirely through both blades.

Those skilled in the art will appreciate that the flexibility of the razor head of the present invention would be impeded if upper blade 20 was affixed to lower blade 30 along its entire longitudinal length. This is due to the fact that as the razor head 10 flexes, points on upper blade 20 will have a tendency to move laterally relative to points on lower blade 30. If lateral shifting is not permitted, flexing is impeded and the blades will not flex evenly thereby distorting the blade geometry. Therefore, in accordance with the illustrated embodiment of the present invention, lower blade 30 is secured at mid-holes 36, 37 to a number of discrete blade platforms 70 which are movable relative to each other as explained above. The mid-holes 36, 37 of lower blade 30 receive securing members during the formation of the flexible razor head 10. Since upper blade 20 has no holes at these positions, the upper blade 20 does not receive these securing members. Consequently, the shifting of upper blade 20 relative to lower blade 30 is not impeded at these positions. Additionally, in a manner described in further detail below, left position hole 38 which is preferably larger than the right position hole 39, also receives some thermoplastic material which also may tend to fasten lower blade 30 to a corresponding blade platform 70. In contrast, upper blade 20 receives thermoplastic material through oblong, right positioning hole 29 but not at left positioning hole 28.

Razor head 10 is preferably formed by injection molding by first placing lower blade 30 into a mold with locating pins extending from the bottom of the mold cavity through positioning holes 38 and 39. A mold cavity spacer is then positioned on top of bottom blade 30 and upper blade 20 is then positioned on the same positioning pins which extend through positioning holes 28, 29. The placement of the blades 20, 30 on the pins is facilitated by providing each blade with one oblong positioning hole as illustrated. Those skilled in the art will appreciate that the mold member positioned between the blades is designed to prevent the flow of thermoplastic material where such material is not ultimately desired.

The mold is then closed and a thermoplastic material, such as polypropylene, is injected into the mold cavity to form flexible razor head 10. Those skilled in the art will appreciate that other material may be used in the preferred molding process of the present invention such as polyethylene. Polypropylene has been found to be desirable since it allows the desired amount of flexibility and cost effective manufacturing while providing adequate support for the blades and sufficient rigidity to maintain the desired blade geometry. Polypropylene also provides a low mold temperature relative to other materials known in the art for the formation of razor heads. This low mold temperature is desirable if a shaving aid is to be added to the flexible razor head in a sequential molding process.

A flexible razor head of the present invention is adapted to be supported by a razor mechanism (illustrated partially in phantom in Fig. 9) having outwardly biased attachment members. The illustrated flexible razor head 10 is shown in Figure 6 as having an attachment slot 110 defined by outer sidewalls 115 and 120, inner wall 135, outer wall 140, and slot cover plates 150 and 160 having inner edges 151 and 161, respectively. Inner wall 135 has an inner wall slot 180 defined by inner side walls 125 and 130. The slot cover plates 150 and 160 cover the outer ends of the slot 110 but, as shown in Figure 6, leave a portion of the inner end of slot 110 and the entire central region of slot 110 uncovered for the passage of an attachment member of a razor. The outwardly biased arms are advantageously designed to maintain the razor cartridge in a substantially linear configuration in the absence of shaving forces.

As best illustrated in Figure 9, inner side walls 125 and 130 may be extended downwardly together forming an attachment neck 90. Attachment neck 90 is designed to provide a greater bearing surface for a razor attachment member (shown in phantom) thereby reducing the potential for flexible razor head to rock when attached to a razor mechanism.

A flexible razor head of the present invention may also be designed to receive one or more additional elements such as a shaving aid in a subsequent mold-

ing or assembly step. For example, during the molding of a flexible razor head according to the present invention, a blade retainer may be formed with depressions designed to receive a shaving aid. The completed flexible razor head could then be subjected to a supplemental molding step wherein a shaving aid is sequentially molded into the recesses in the blade retainers.

In accordance with another preferred embodiment illustrated in Figures 12 to 14, one or more of the blade retainers 140 is initially molded with a receptacle 142 having flexible sidewalls 143. The initially molded flexible razor head 110 is then subjected to a subsequent molding step wherein side walls 143 are first bent downwardly into receptacle 142 and then a shaving aid is injected into receptacle 142. Figures 13 and 14 illustrate the final positioning of the shaving aid 145 on blade retainers 140. The cut away view of Figure 14 illustrates the positioning of sidewall 143 below the shaving aid 145 in the final flexible razor head of this embodiment.

Exemplary materials constituting the shaving aid may comprise one or various combinations of the following:

a. A lubricating agent for reducing the frictional forces between the razor head and the skin, e.g. a microencapsulated silicone oil.

b. An agent which reduces the drag between the razor parts and the shaver's face, e.g. a polyethylene oxide in the range of molecular weights of about 100,000 to about 6,000,000; a non-ionic polyacrylamide; and/or a natural polysaccharide derived from plant materials such as "guar gum".

c. An agent which modifies the chemical structure of the hair to allow the razor blade to pass through the whiskers very easily, e.g. a depilatory agent is one example.

d. A cleaning agent which allows whiskers and skin debris to be washed more easily from the razor parts during shaving, e.g. a silicone polyethylene oxide block copolymer and detergent such as sodium lauryl sulphate.

e. A medicinal agent for killing bacteria, or repairing skin damage and abrasions.

f. A cosmetic agent for softening, smoothing, conditioning or improving the skin.

g. A blood coagulant for the suppression of bleeding that occurs from nicks and cuts.

As has been mentioned hereinabove, the configuration of the shaving aid, its plate of application to the razor cartridge, the manner of attachment and/or other means and method of incorporation may vary widely to fit particular requirements.

Though the present invention has been illustrated utilizing two blades, those skilled in the art will appreciate that the advantage of the present invention may also be achieved using a single blade razor head.

Claims

1. A flexible razor head (10) characterised by comprising:

   at least one blade (20 or 30) having a cutting edge (21 or 31):

   a blade support comprising at least two blade platforms (70) and at least one corrugation (60) disposed between two of said blade platforms (70); and

   a plurality of discrete blade retainers (40) integrally formed with said blade support and disposed above and adjacent to said blade (20 or 30).

2. A flexible razor head (10) according to claim 1 characterised in that said razor head (10) comprises at least three blade retainers (40).

3. A flexible razor head according to claim 1 or 2 characterised in that said flexible razor head (10) comprises at least seven blade platforms (70) with a corrugation (60) between adjoining blade platforms (70).

4. A flexible razor head (10) according to claim 2 characterised by comprising at least seven discrete blade retainers (40), each integrally formed with one of said blade platforms (70).

5. A flexible razor head (10) according to any one of the preceding claims characterised by comprising an upper blade (20) and a lower blade (30) wherein said blades (20,30) are separated by at least one spacer (100) which is integrally formed with said blade support.

6. A flexible razor head (10) according to claim 5 characterised by comprising a discrete spacer (100) for each of said blade retainers (40).

7. A flexible razor head (10) according to claim 4 wherein said lower blade (30) comprises a lower securing hole (35), said upper blade (20) comprises an upper securing hole (25) positioned substantially above said lower securing hole (35), and said flexible razor head (10) further comprises a securing member (105) extending through said lower securing hole (35) and said upper securing hole (25) and wherein said securing member (105) is integrally formed with a blade platform (70) and a blade retainer (40).

8. A flexible razor head (10) according to claim 7 characterised in that said lower securing hole (35) is substantially centrally located in said lower blade (30).

9. A flexible razor head (10) according to any one of claims 5 to 8 characterised in that said lower blade (30) is directly affixed to a plurality of said blade platforms (70).

10. A flexible razor head (10) according to any one of claims 5 to 9 characterised in that said lower blade (30) comprises a first positioning hole (38) and a second positioning (39) and said first positioning hole (38) is larger than said second positioning hole (39).

11. A flexible razor head (10) according to claim 10 characterised in that said lower blade (30) is attached to a platform member (70) with a securing member which extends through said first positioning hole (38).

12. A flexible razor head (10) according to any one of the preceding claims characterised by comprising a plurality of guard members (50) disposed forwardly of said cutting edge (21 or 31) and integrally formed with said blade support.

13. A flexible razor head (10) according to claim 12 characterised in that said guard members (50) are each supported by a guard support (55) and wherein each of said guard supports (55) is integrally formed with one of said blade platforms (70).

14. A flexible razor head (10) according to any one of the preceding claims characterised by further comprising means for attaching said flexible razor head (10) to a razor.

15. A flexible razor head (10) according to claim 14 characterised in that said attaching means comprises two slots (110,180) integrally formed in the bottom of said blade support and adapted to receive an outwardly biased attachment member of a razor.

16. A flexible razor head according to claim 14 characterised in that said attaching means comprises an attachment neck (90) which extends lower than said guard supports (55).

17. A flexible razor head according to any one of the preceding claims characterised in that said blade support and said blade retainers (40) comprise polypropylene.

FIG. 1

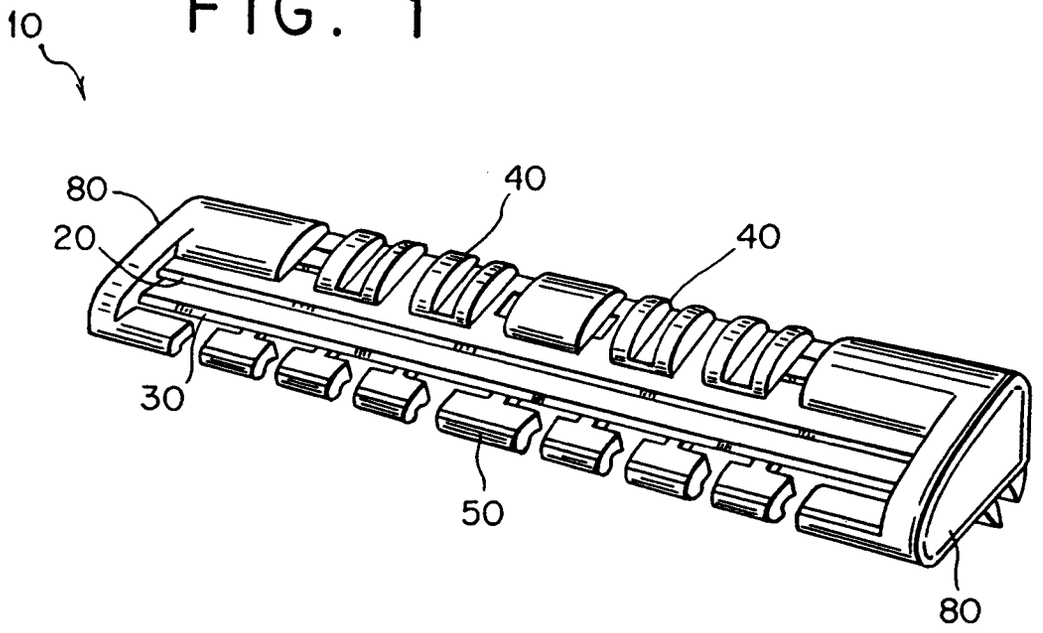

FIG. 2

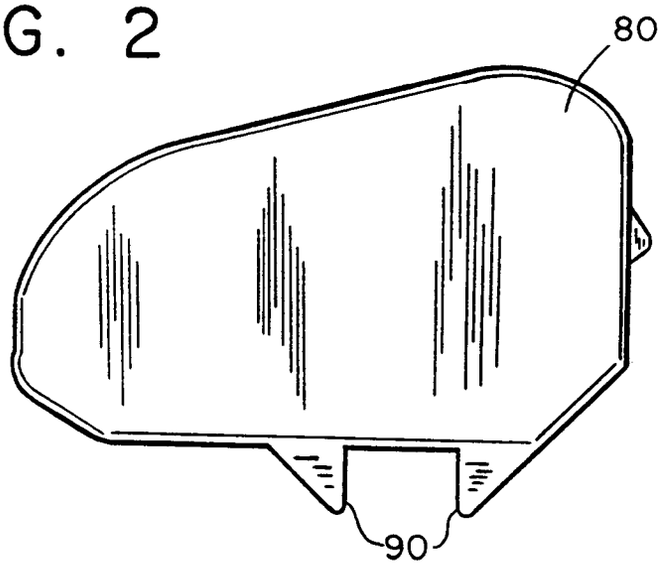

FIG. 3

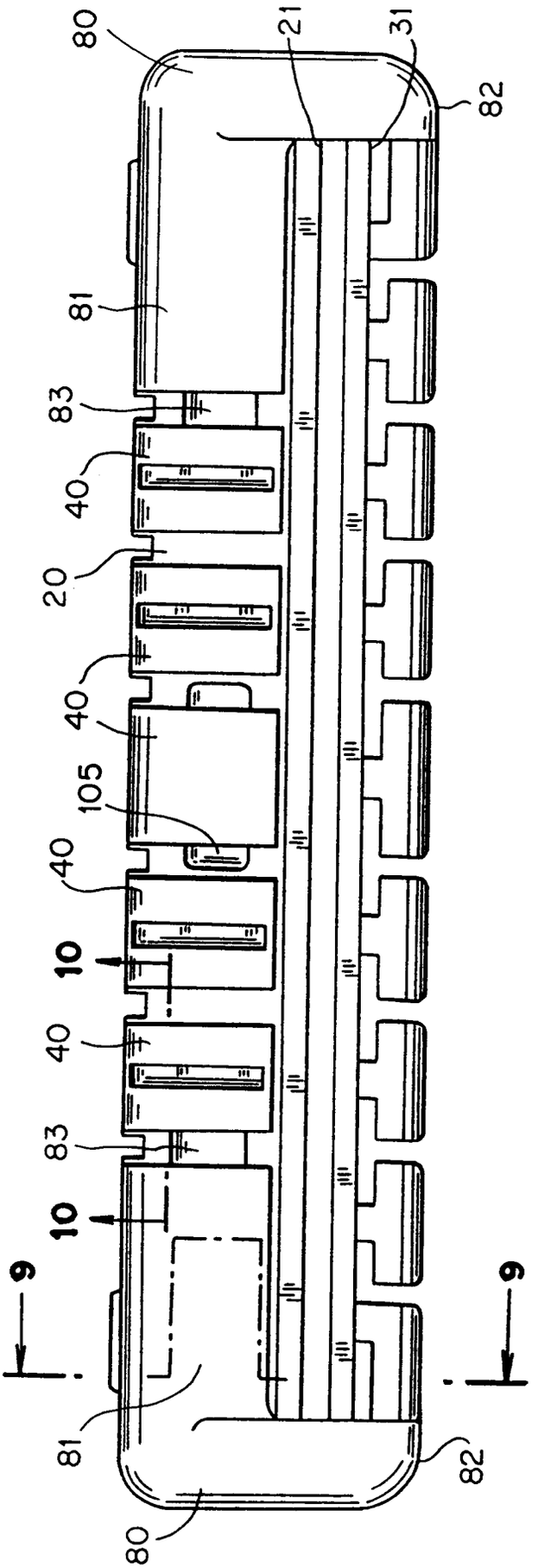

FIG. 13

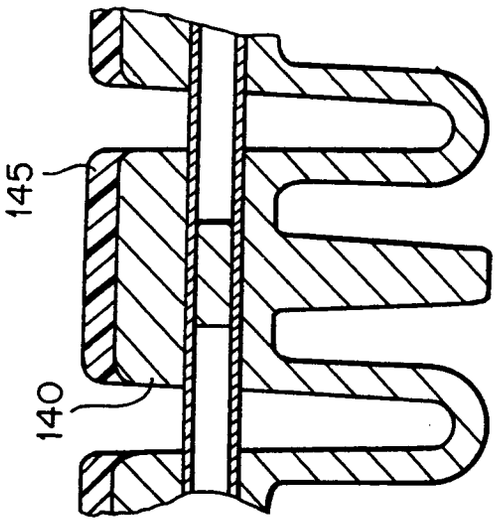

FIG. 4

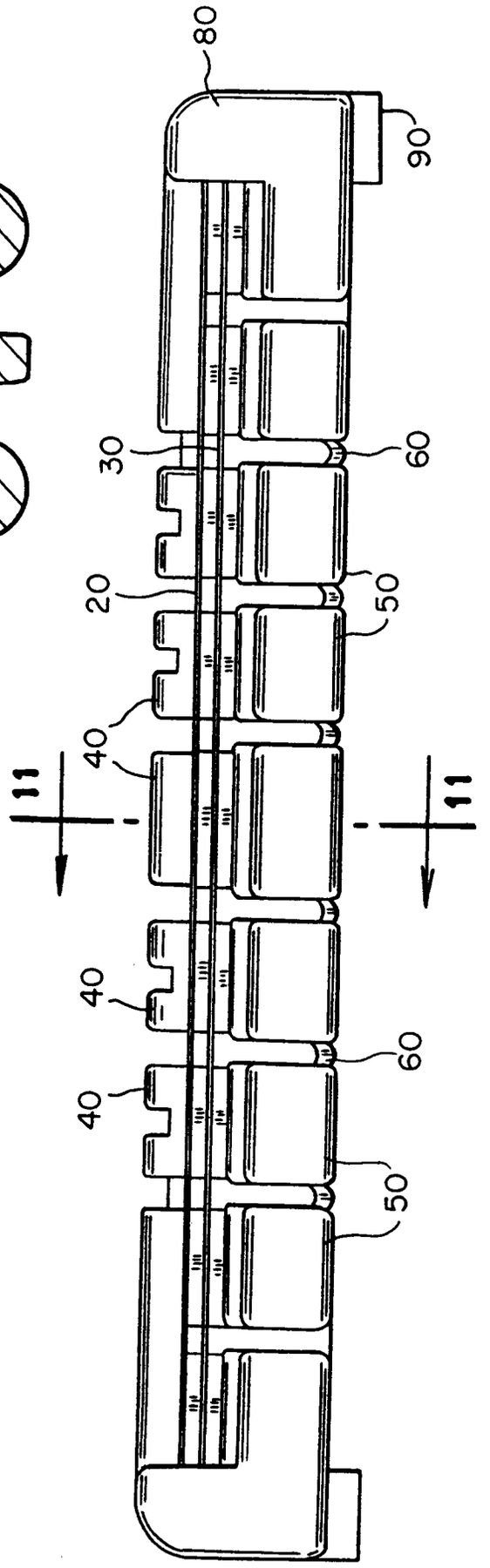

FIG. 12

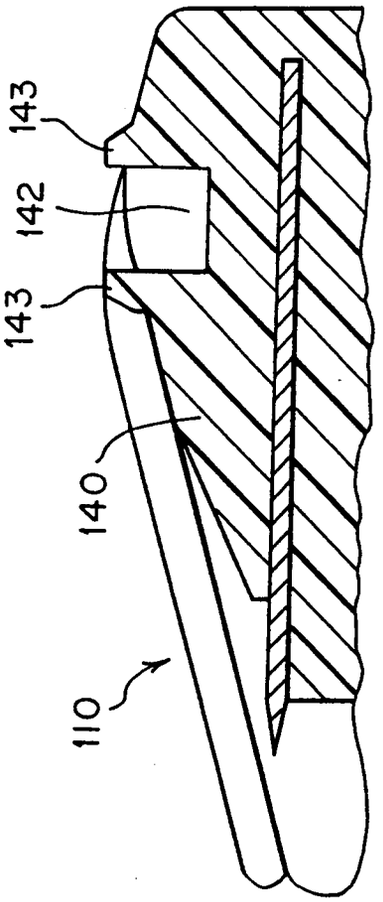

FIG. 5

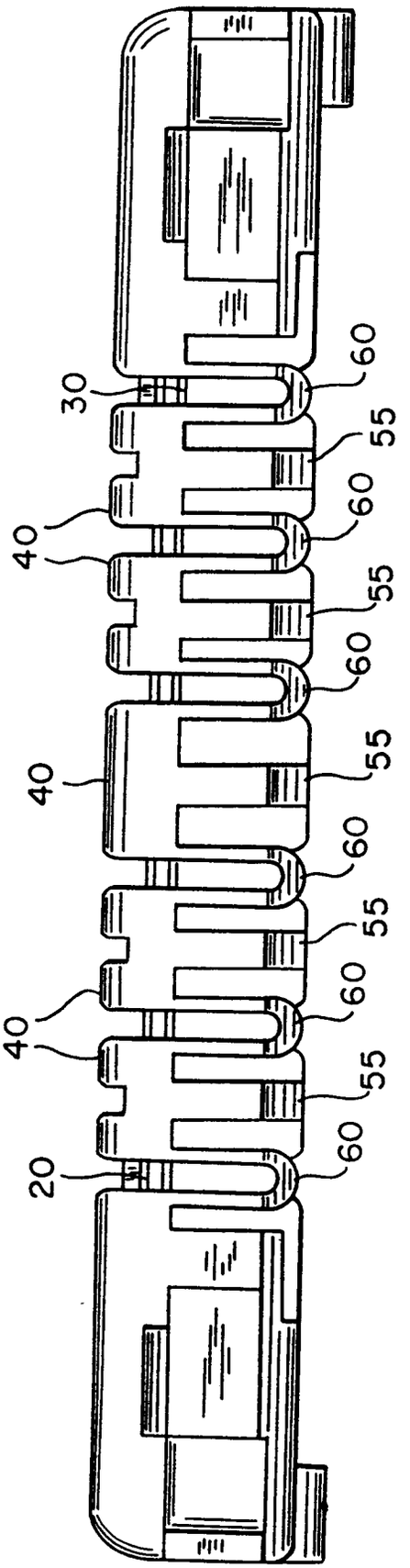

FIG. 6

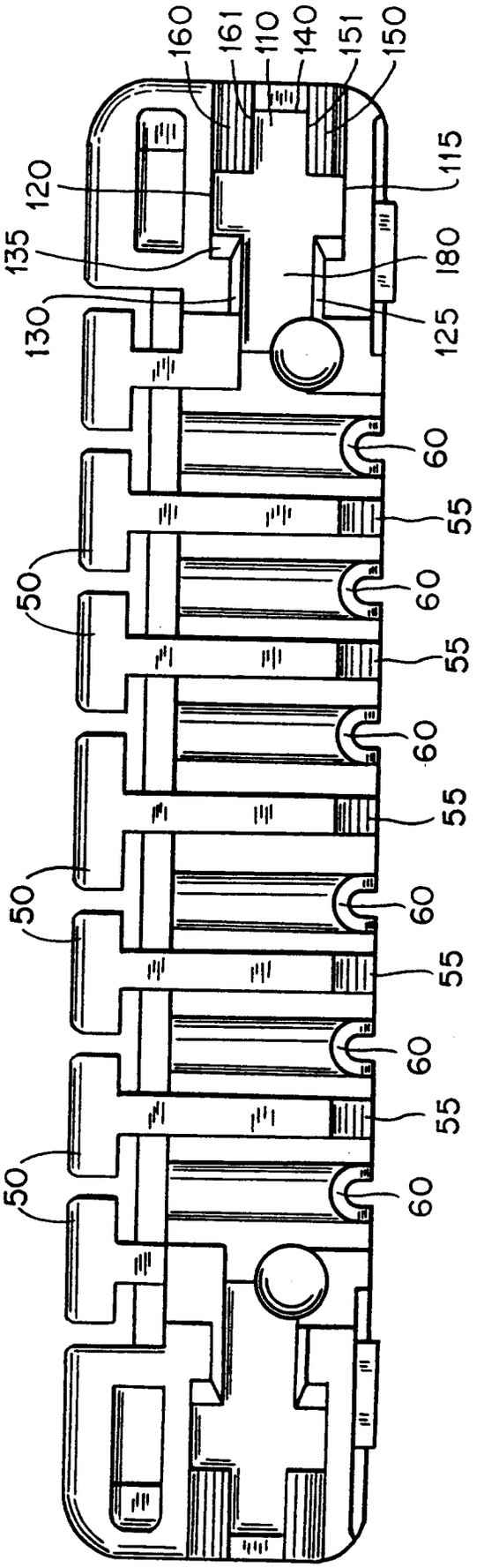
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FIG. 8

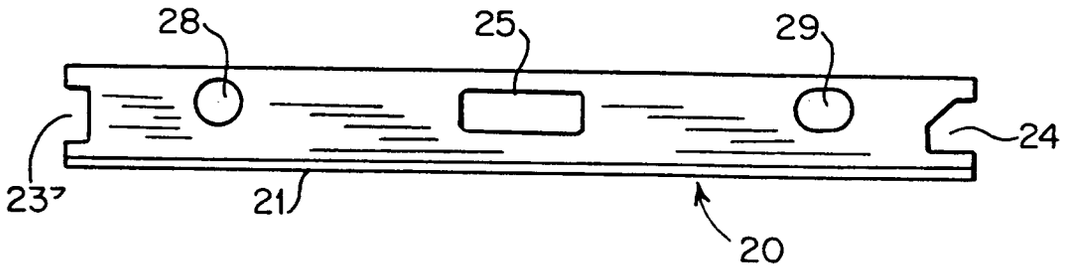


FIG. 7

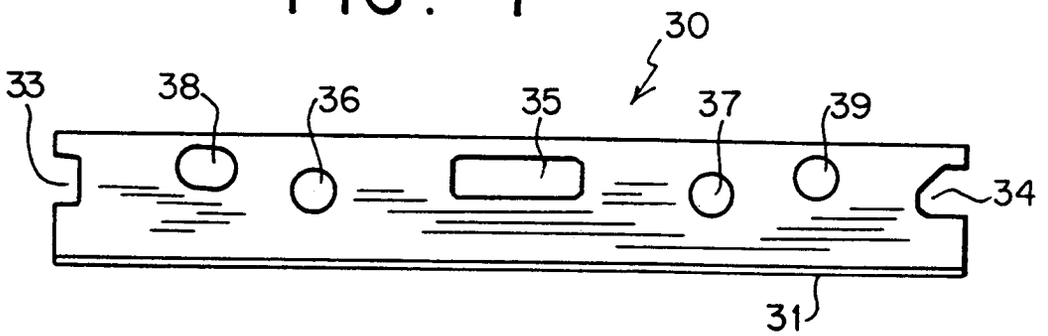


FIG. 14

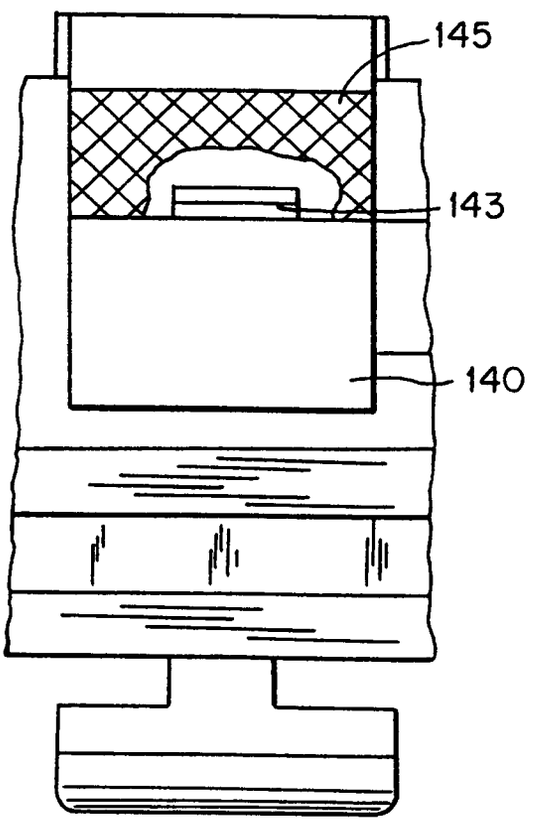


FIG. 9

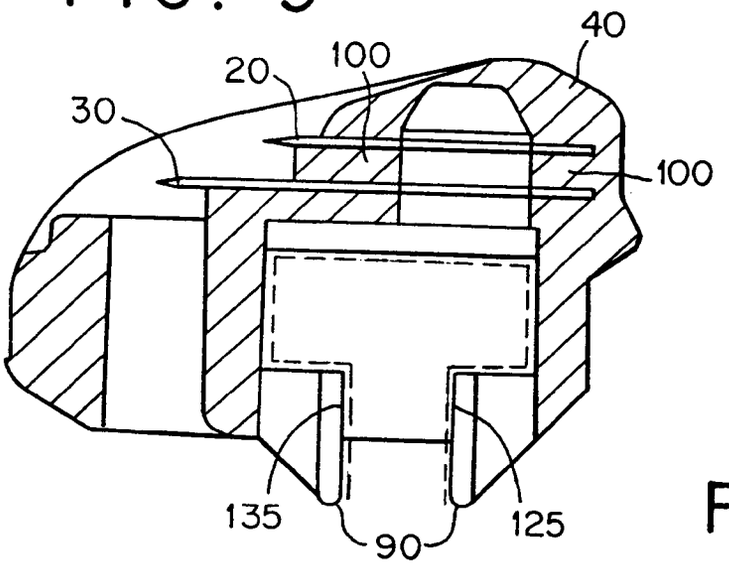


FIG. 10

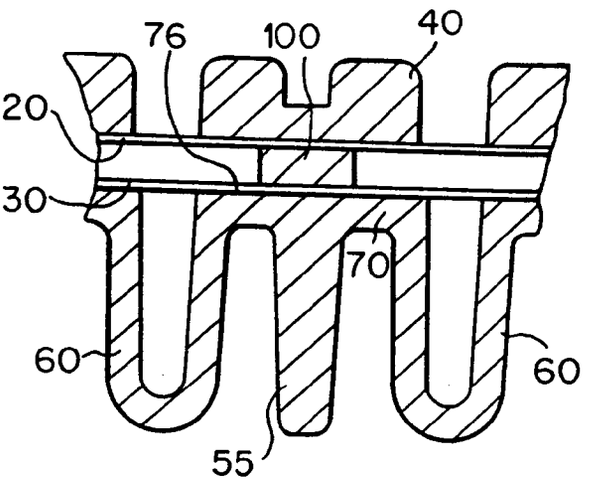
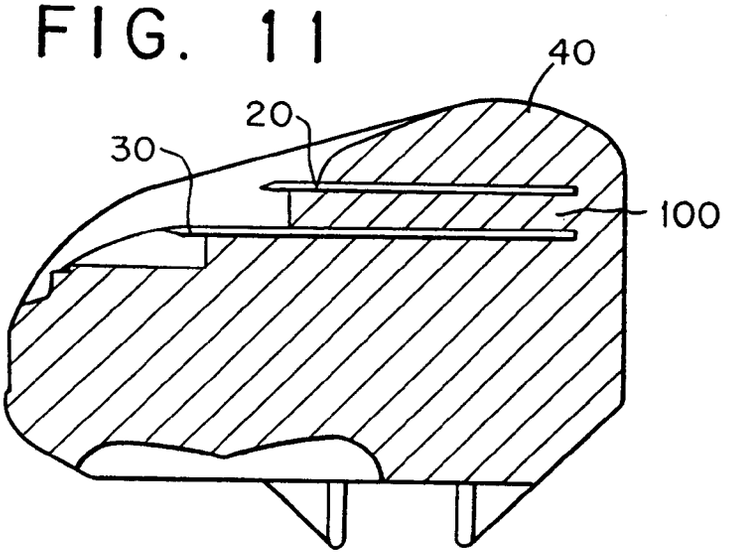


FIG. 11



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 6629

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.5)
Y	EP-A-0 314 266 (WARNER-LAMBERT COMPANY) * figures 1,3,4,8,9 * * page 4, line 10 - line 47 *	1-6,9, 12-15	B26B21/40
A	---	7,8,11	
Y	US-A-4 409 735 (CARTWRIGHT ET AL) * figures 1,2,7 * * column 2, line 60 - column 3, line 26 * * column 8, line 3 - line 18 *	1-6,9, 12-15	
A	---	16	
A	GB-A-2 119 690 (WARNER-LAMBERT COMPANY) * figures 3-10 * * page 1, line 34 - line 52 * * page 2, line 94 - line 121 *	1,7-14	

A	EP-A-0 178 066 (WARNER-LAMBERT COMPANY) * figures 1-4 * * claims *	1,3,7-9	
	---		TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	EP-A-0 348 627 (PERMATIK CELIK VE PLASTIK SANAYI A.S.) * figure 1 *	17	B26B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	05 NOVEMBER 1991	RAVEN P.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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