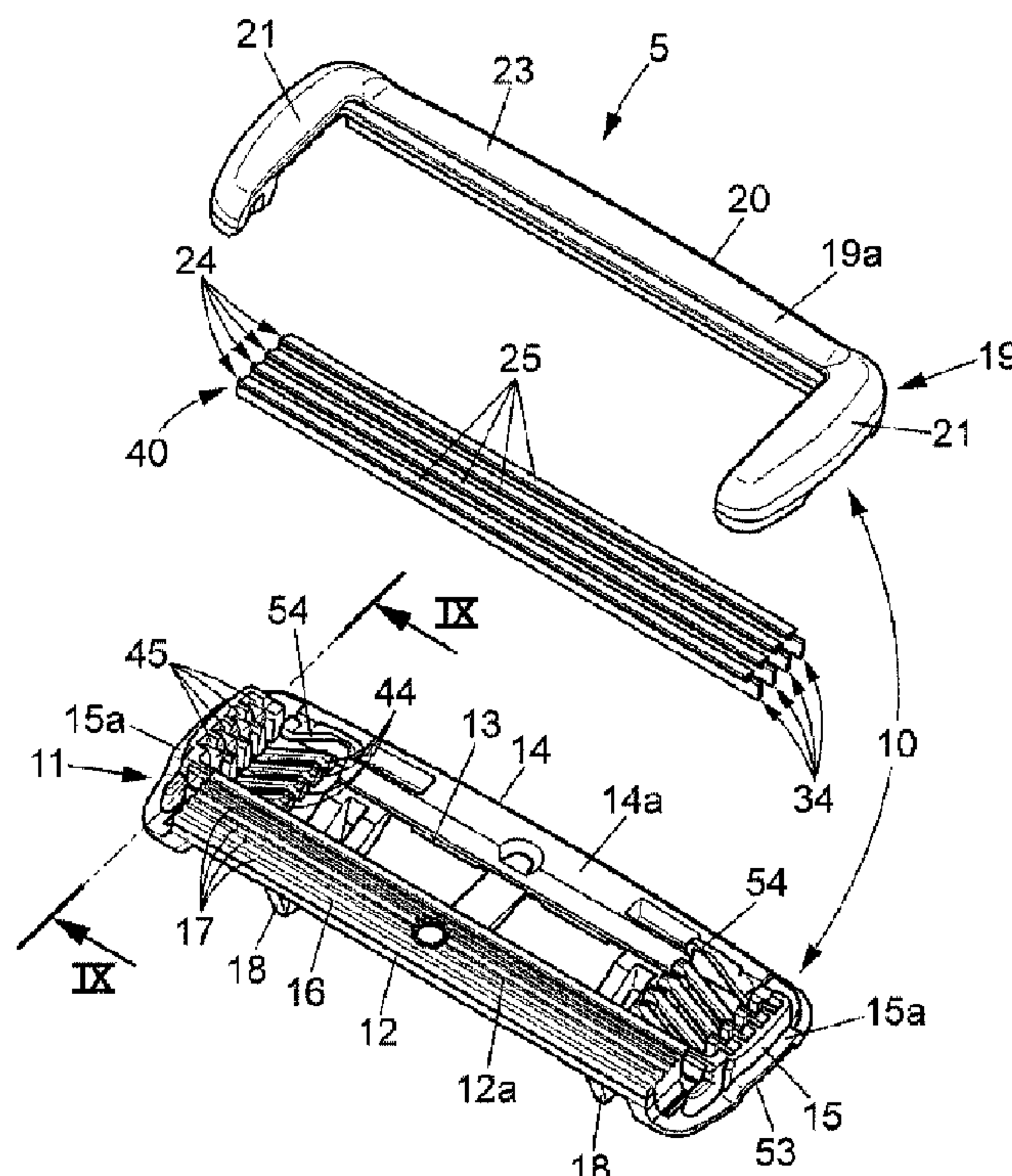




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CARTOUCHE DE RASOIR DE SECURITE
(54) Title: PROCESS AND STATION FOR MANUFACTURING A SAFETY RAZOR CARTRIDGE, AND SAFETY RAZOR
CARTRIDGE



(57) Abrégé/Abstract:

A process for manufacturing a safety razor cartridge comprising: providing an assembly (59) comprising: a platform (11) comprising a cap portion (14) and two lateral side portions (15), a cutting member (24) guidedly movable with respect to said platform (15), a cover (19) comprising a cap portion (20) covering the cap portion (14) of the platform and two lateral side portions (21) covering the lateral side portions (15) of the platform, welding the cover (19) to the platform by applying an ultrasonic beam to a plurality of discrete locations (57).



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(54) **Title:** PROCESS AND STATION FOR MANUFACTURING A SAFETY RAZOR CARTRIDGE, AND SAFETY RAZOR CARTRIDGE

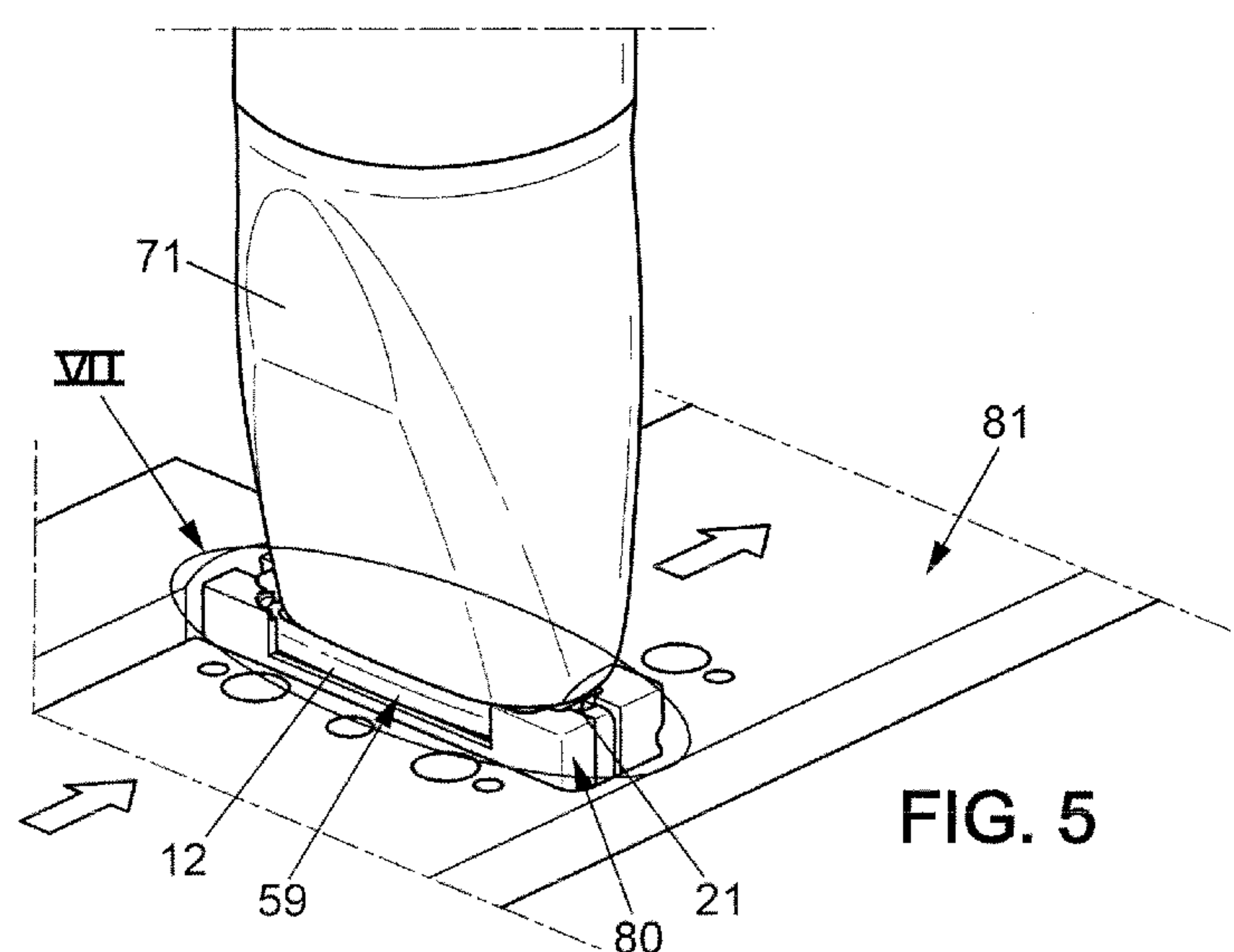


FIG. 5

(57) **Abstract:** A process for manufacturing a safety razor cartridge comprising: providing an assembly (59) comprising: a platform (11) comprising a cap portion (14) and two lateral side portions (15), a cutting member (24) guidedly movable with respect to said platform (15), a cover (19) comprising a cap portion (20) covering the cap portion (14) of the platform and two lateral side portions (21) covering the lateral side portions (15) of the platform, welding the cover (19) to the platform by applying an ultrasonic beam to a plurality of discrete locations (57).

PROCESS AND STATION FOR MANUFACTURING A SAFETY RAZOR
CARTRIDGE, AND SAFETY RAZOR CARTRIDGE

FIELD OF THE INVENTION

5 The instant invention relates to processes for manufacturing a safety razor cartridge, to safety razor cartridges manufactured by such processes, and to stations for manufacturing a safety razor cartridge.

BACKGROUND OF THE INVENTION

10 In particular, the instant invention is related to a process for manufacturing a safety razor cartridge with movable blades.

 WO 2005/108,024 discloses a process for manufacturing a safety razor cartridge which includes
15 crimping one or a plurality of razor blades to a guard, then laser welding the cap to the guard. Although this process is very efficient and reliable for a cartridge having fixed blades, there is a need to provide an industrially feasible response to the problem of assembling
20 a razor cartridge with movable blades.

SUMMARY OF THE INVENTION

 To this aim, it is provided a process for manufacturing a safety razor cartridge comprising:

- providing an assembly comprising:
 - 25 . a platform having a top face, the platform comprising a cap portion and two lateral side portions,
 - . at least one cutting member extending between said lateral side portions of the platform, said cutting member being supported by said platform, said
30 cutting member being movable with respect to said platform, said platform and cutting member cooperating to guide a movement of said cutting member with respect to the platform,
 - . a cover having a bottom face facing the top
35 face of the platform, the cover comprising a cap portion

covering the cap portion of the platform and two lateral side portions covering the lateral side portions of the platform,

- welding the cover to the platform by applying an ultrasonic beam to a plurality of discrete locations of the assembly.

With these features, a fast, efficient and reliable process can be industrially implemented.

Further, it is provided a safety razor cartridge comprising:

- a platform having a top face, the platform comprising a cap portion and two lateral side portions,
- at least one cutting member extending between said lateral side portions of the platform, said cutting member being supported by said platform, said cutting member being movable with respect to said platform, said platform and cutting member cooperating to guide a movement of said cutting member with respect to the platform,
- a cover having a bottom face facing the top face of the platform, the cover comprising a cap portion covering the cap portion of the platform and two lateral side portions covering the lateral side portions of the platform,
- a plurality of discrete ultrasonic-welded bonding portions between the cover and the platform.

Further, it is provided a razor comprising such a cartridge.

Further, it is provided an ultrasonic welding station comprising:

- a base station adapted to hold an assembly comprising:
 - . a platform having a top face, the platform comprising a cap portion and two lateral side portions,
 - . at least one cutting member extending between said lateral side portions of the platform, said

cutting member being supported by said platform, said cutting member being movable with respect to said platform, said platform and cutting member cooperating to guide a movement of said cutting member with respect to the platform,

. a cover having a bottom face facing the top face of the platform, the cover comprising a cap portion covering the cap portion of the platform and two lateral side portions covering the lateral side portions of the platform,

- an ultrasonic beam application device adapted to apply to a plurality of discrete locations of the assembly an ultrasonic beam adapted to weld the cover to the platform.

In some embodiments, one might also use one or more of the features defined in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Other characteristics and advantages of the invention will readily appear from the following description of one of its embodiments, provided as a non-limitative example, and of the accompanying drawings.

On the drawings :

- figure 1 is a perspective view of a safety razor according to one embodiment of the invention,

- figure 2 is an exploded perspective view of the blade unit of the safety razor of figure 1,

- figure 3 is a perspective view of a cover seen from the bottom,

- figure 4 is a partial perspective view of a cutting member,

- figure 5 is a detail view of the application of the station of Fig. 6 to a cartridge,

- figure 6 is a schematic view of an ultrasonic welding station,

- figure 7 is a detail view of Fig. 5, in cross-

section along the symmetry axis of the cartridge,

- figure 8 is a graph of ultrasonic horn stroke (H) versus time,

- figure 9 is a partial cross section of the complete
5 blade unit, taken along line IX-IX of figure 2.

DETAILED DESCRIPTION

In the figures, the same references denote identical or similar elements.

Figure 1 shows a safety razor 1 (also called wet
10 shaver), i.e. a shaver the blades of which are not driven by a motor relative to the blade unit.

The shaver 1 includes a handle 2 extending in a longitudinal direction L between a proximal portion 3 and a distal portion 4 bearing a blade unit 5 or shaving head. The
15 longitudinal direction L may be curved or include one or several straight portions.

The blade unit 5 includes an upper face 6 equipped with one or several cutting members and a lower face 7 which is connected to the distal portion 4 of the handle 2 by a
20 connection mechanism 8. The connection mechanism 8 may for instance enable the blade unit 5 to pivot relative to a pivot axis X which is substantially perpendicular to the longitudinal direction L. Said connection mechanism may further enable to selectively release the blade unit for the
25 purpose of exchanging blade units.

In the particular example shown in figure 1, the handle 2 may further include an internal vibrating mechanism (not shown), which may be for instance as described in document WO-A-2006/027018 and which is controlled by a user actuated
30 switch 9.

Of course, the present invention is neither limited

to such vibrating handle, nor to any particular connection mechanism connecting the blade unit 5 to the handle 2.

As shown in figure 2, the blade unit 5 includes a frame 10 which is made solely of synthetic materials, i.e. thermoplastic materials (polystyrene or ABS, for example) and elastomeric materials.

More precisely, the frame 10 includes a plastic platform member 11 connected to the handle 2 by the connection mechanism 8 and having:

- 10 - a guard 12 extending parallel to the pivot axis X,
- a blade receiving section 13 situated rearward of the guard 12 in the direction of shaving,
- a cap portion 14 extending parallel to the pivot axis X and situated rearward of the blade receiving section 13 in the direction of shaving,
- 15 - and two side portions 15 joining the longitudinal ends of the guard 12 and of the cap portion 14 together.

20 Each of the guard 12, the cap portion 14 and the side portions 15 have a top face (respectively 12a, 14a and 15a) visible on Fig. 2, and an opposite bottom face. These top faces 12a, 14a and 15a together form the so-called top face of the platform.

25 Each of the side portions 15 has a raised middle portion 53 level with the blade receiving section 13.

Further, the cap portion 14 has two symmetrical triangular lances 54 protruding from the top face 14a of the cap portion.

30 In the example shown in the figures, the guard 12 is covered by an elastomeric layer 16 forming a plurality of fins 17 extending parallel to the pivot axis X.

Further, in this particular example, the underside of the platform member 11 includes two shell bearings 18 which belong to the connection mechanism 8 and which may be

35

for example as described in the above-mentioned document WO-A-2006/027018.

The frame 10 further includes a plastic cover 19 having a top face 19a (visible on figure 2) and an opposite bottom face 19b (see Figure 3) which faces the top face 12a, 14a, 15a of the components of the platform 11. The cover 19 exhibits a general U shape, with a cap portion 20 partially covering the cap portion 14 of the platform and two side members 21 covering the two side members 15 of the platform. In this embodiment, the cover 19 does not cover the guard 12 of the platform.

The cap portion 20 of the cover 19 may include a lubricating strip 23 which is oriented upward and comes into contact with the skin of the user during shaving. This lubricating strip may be formed for instance by co-injection with the rest of the cover.

As shown on Fig. 3, the vertical edge of the side members 21 of the cover 19 each comprise a recess 55 of shape complementary with the shape of the raised portions 53 of the side members 15 of the platform. Further recesses 56 are formed in the bottom face 19b of the cap portion 20 of shapes which are complementary to the shapes of the lances 54 of the cap portion 14 of the platform.

Bonding portions 57 are provided on the bottom face 19b of the cover 19, to be bonded with corresponding portions (not labelled) of the platform 11. The corresponding portions of the platform are for example flat. In an alternative embodiment, some or all of the bonding portions 57 could be provided on the top face of the platform 11, with the corresponding flat portion provided on the bottom face of the cover.

In the present example, bonding portions 57 are provided symmetrically with respect to the symmetry axis of the cartridge. Two bonding portions 57 are provided each in one of the above-mentioned recesses 55. Two other bonding

portions 57 are provided between the recesses 56 and the vertical edge of the cap portion 20 of the cover. Two other bonding portions 57 are provided in the centre of the cap portion 20 of the cover. These two later bonding portions 57 are not aligned with the two previously described ones extending close to the recesses 56.

The bonding portions 57 are for example provided as small parts of material, for example of triangular cross-section, and which are molded during the molding process of the cover 19. Their dimension and location might vary to the above-described ones, although the specifically described one was considered to achieve interesting results.

The bonding portions 57 are each provided in a plane which is globally parallel to the plane. In the detailed example, the bonding portions 57 of the cap member 20 are provided in a plane parallel and distinct from the plane containing the bonding portions 57 of the side portions 21. Thus, efficient bonding is achieved.

As shown on Figure 4, at least one cutting member 24 is movably mounted in the blade receiving section 13 of the platform. The blade receiving section 13 may include several cutting members 24, for instance four cutting members as in the example shown in the drawings.

Each cutting member 24 includes a blade 25 which is formed by a flat steel strip with a cutting edge 26 oriented forward in the direction of shaving. Each blade 25 has an upper face 27 oriented towards the skin to be shaved and a lower face 28 oriented toward the handle 2. The upper and lower faces 27, 28 of the blade include respectively two parallel main surfaces 29, 30 and two tapered facets 31, 32 which taper towards the cutting edge 26.

Each blade 25 extends longitudinally, parallel to the pivot axis X, between two lateral ends 33.

Each blade 25 is borne by a bent support 34. The

bent support 34 is a sheet metal part made out of steel with a bent profile including:

- a substantially flat lower portion 35 (for example substantially perpendicular to the shaving plane),
- 5 - and a substantially flat upper portion 39 which extends parallel to the blade 25.

The blade 25 is fixed on the upper portion 39 of the bent support by any known means, for instance by laser spot welding.

10 The angle α of the upper portion 39 and of the blade 25 with respect to the shaving plane may be around 22° .

The lower portion 35 of the bent support 34 extends longitudinally, parallel to the pivot axis X, between two
15 lateral portions 40. Each lateral portion 40 includes a side edge 41.

Besides, the upper portion 39 of the bent support extends longitudinally between two lateral edges each including a rounded protrusion 42 which is constituted by a
20 lateral wing with rounded angles protruding laterally from the upper portion 39 and from a corresponding lateral end 33 of the blade.

Further, a rounded indent 43 is cut out from the sheet metal forming the blade support, said indent
25 separating the rounded protrusion 42 from the lateral edge 41 of the lower portion.

The side edges 41 of the lower portion of the bent support protrude laterally from the lateral ends 33 of the blade and from the rounded protrusions 42.

30 The bent support may be made from a flat sheet metal part which is then bent before welding of the blade 25 on the upper portion 39 thereof.

As shown in figure 2, each cutting member 24 is borne by two elastic fingers 44 which are molded as a
35 single piece with the platform 11 and which extend towards

each other and upwardly from both side members 15 of the platform.

Besides, as shown in figure 2, the end portions 40 of the bent supports are slidably guided in vertical slots 45 (i.e. slots which are substantially perpendicular to the shaving plane) provided in the inner face of each side member 15 of the platform.

The blade members 24 are elastically biased by the elastical arms 44 toward a rest position. In this rest position, the upper faces 27 of the blades, at each lateral end of the blades, bear against corresponding upper stop portions 52 which are provided on the bottom face 19b of each side member 21 of the cover, said side member 21 covering the slots 45 (see Figure 9).

Therefore, the rest position of the blade members 24 is well defined, therefore enabling a high shaving precision.

As shown on Figure 5, an assembly 59 comprising the platform 11, the cutting members 24 inserted in the slots 45 and supported by the elastic fingers 44, and the unassembled cover 19 is provided into a nest 80 displaced along a conveying path 81 to an ultrasonic welding station 60 shown on Fig. 6. The assembly 59 is displaced there by any suitable way. At this stage, the cover 19 faces upward and is supported on the platform 11 by the lances 54 inserted in the recesses 56 and/or the raised portions 53 inserted in the recesses 55. The bottom face 19b of the cover 19 is distant from the top face 15a, 14a of the platform, due to the projecting bonding portions 57. Still, the lateral sides 21 of the cover 19 work as stops for the cutting members 24.

The ultrasonic welding station 60 comprises the following elements:

- a base 61, which is underneath the nest 80 and support it during the ultrasonic welding,

- a fixed bracket 62, which is stationary and holds the base 61,
- a sliding bracket 63 which slides along the vertical direction, the bracket 63 holding an ultrasonic beam application device 64, to be described later in more details,
- a driving mechanism 65, which is for example driven by a motor (not shown), is carried by the support 62 and applies a periodic movement to the sliding bracket 63 relative to the fixed bracket 62. For example, the driving mechanism 65 includes a cam 66 having a specific cam profile which pushes one end 67a of a rod 67 which, at its other end 67b, is connected to the sliding bracket 63 so that the sliding bracket performs a reversible motion (back and forth movement),
- the ultrasonic beam application device 64,
- a power source, schematically shown as 68, providing suitable energy to the ultrasonic beam application device 64, for example of 20 kHz and able to deliver 2kW.

The ultrasonic beam application device 64 itself comprises a converter 69, at which the ultrasonic electrical energy from the power supply 68 is applied. The converter uses for example piezoelectric ceramic elements to transform the high frequency electrical oscillations into mechanical vibrations at the same frequency as the electrical oscillations.

The ultrasonic beam application device 64 further comprises a booster 70 which is used as a mechanical transformer to modify the amplitude of vibrations applied to the assembly 59. The booster has for example a resonant half-wave section of titanium. It is mounted below the converter. It also provides a clamping point of the ultrasonic beam application device 64 to the bracket 63.

The ultrasonic beam application device 64 further

comprises a horn 71 tuned as a half-wave section and that applies the necessary force and vibration uniformly to the parts to be assembled. The horn is mounted to the booster. It transfers the ultrasonic vibrations from the converter
5 (modified by the booster 70) to the assembly 59. The shape of the horn determines the amplitude at the face of the horn. The horn is for example designed to provide an amplitude of between 10 and 30 microns at a frequency of 20 kHz.

10 As shown on Fig. 7 (the cross-section of Fig. 7 is taken along the symmetry line of the cover), the tip 82 of the horn 71 has a vibration application device having a profile 83 matching the profile of the cover 19. It has a central portion 84 shaped to come in contact with the cap
15 portion 20 of the cover 19, and lateral portions 85 shaped to come in contact with the lateral side portions 21 of the cover.

The ultrasonic welding station 60 periodically operates as follows, in relation to Fig. 8, which plots the
20 stroke (H) of the ultrasonic beam application device 64 with respect to a reference as a function of time (for one cycle):

From point A to point F, the ultrasonic beam application device 64 is held high, then rapidly moved
25 down, then held, then slowly moved down, then held, then quickly moved up and held. From point A to point B, a new assembly 59 is brought to the base station 61. At point B, the ultrasonic beam application device 64 is then held low facing, with no contact, the assembly 59.

30 From point B to point C, the ultrasonic beam application device 64 is slowly moved down until it contacts the assembly 59.

At point C, ultra-sonic vibrations are started.

From point C to point D, ultra-sonic vibrations are
35 locally focalised on the bonding portions (so-called

"energy directors") 57 to generate mechanical vibrations at the interface between the platform and the cover, producing a sharp rise of temperature at the level of the bonding portions 57. Vibrations are applied simultaneously to all the bonding portions 57, which melt. Some of the vibrations can be applied through the lubricating strip 23 of the cover (for the bonding portions 57 which are part of the cap portion of the cover). Bonding occurs only at the bonding portions 57, since there is a small gap between the upper face of the platform and the lower face of the cover outside the bonding portions. Continued pressure of about 14 kg is applied by the horn 71 to the cover 19, by the continuous lowering of the horn 71 to point D. The booster is set to operate at 1:1.5 and 60%, and the horn is set to apply an amplitude of 22 microns. An energy of 18 J is transferred to the assembly. The cover is lowered simultaneously to the horn, and is guided with respect to the platform by the cooperation of the guiding features 53, 54, 55, 56.

At point D, vibrations are stopped.

From point D to point E, the horn 71 is still in contact with the cover 19, while the molten materials cools down and solidifies, thereby achieving efficient bonding at the bonding portions 57.

From point E to point F, the horn 71 is raised quickly and then held high while the bonded cartridge is removed from the station.

The cycle time of operation (between point A and point F) can be as low as 0.3 seconds, while still providing the expected results.

Although a specific embodiment was disclosed above, it is believed that the parameters of the ultrasonic welding could be chosen in the following range, while still providing an efficient bonding process:

Amplitude: 50 to 90%

13

Frequency: 20 Khz

Energy: 15 to 22 J

Pressure: 10 to 16 Kg.

Cycle time: 90 to 200 rotations per minute (rpm).

5 After assembly, the cap portion 20 of the cover forms, with the cap portion 14 of the platform, a cap 22 with comes into contact with the skin of the user during shaving.

10 Besides, the side members 21 of the cover form, together with the side members 15 of the platform, two side portions of the frame, joining the guard 12 to the cap 22. During the shaving operation, the cutting members 24 are guidedly movable relative to the platform.

15 It should be noted that, unlike laser welding, ultrasonic welding could be performed to weld together parts of the same color. Thus, there is no need for a pigment to be added in one of the parts to be welded, thereby leading to a product with good perceived quality.

CLAIMS

1. A process for manufacturing a safety razor cartridge comprising:

- providing an assembly comprising:
 - . a platform having a top face, the platform comprising a cap portion and two lateral side portions,
 - . at least one cutting member extending between said lateral side portions of the platform, said cutting member being supported by said platform, said cutting member being movable with respect to said platform, said platform and cutting member cooperating to guide a movement of said cutting member with respect to the platform, and
 - . a cover having a bottom face facing the top face of the platform, the cover comprising a cap portion covering the cap portion of the platform and two lateral side portions covering the lateral side portions of the platform,
 - . a plurality of discrete bonding portions projecting from at least one of the top face of the platform and bottom face of the cover,
- welding the cover to the platform by applying an ultrasonic beam to said bonding portions through at least one of the platform and the cover.

2. Process according to claim 1 wherein the cap portion and both lateral side portions of at least one of the platform and cover each have at least one of the bonding portions.

3. Process according to any one of claims 1 and 2 wherein the cap portion of at least one of the platform and cover has at least three non-aligned of the bonding portions.

4. Process according to any one of claims 1-3, wherein the cover has a lubricating strip, and wherein the ultrasonic beam is partly applied through the lubricating strip.

5. Process according to any one of claims 1-4 wherein the cover is provided having its two lateral side portions partially covering the cutting members, and wherein the cutting members are biased in abutment with the cover.

6. Process according to any one of claims 1-5 wherein an ultrasonic beam application device is periodically moved between a first position enabling introduction and removal of the assembly to a base station, and a second position in contact with the assembly to apply the ultrasonic beam to the assembly.

7. A process according to any one of claims 1-6, wherein the cap portion of the cover is provided with the bonding portions in a first plane, wherein the side portions of the cover are provided with the bonding portions in a second plane, wherein said second plane is parallel to and distinct from the first plane.

8. A process according to any one of claims 1-6, wherein the cap portion of the platform is provided with the bonding portions in a first plane, wherein the side portions of the platform are provided with the bonding portions in a second plane,

wherein said second plane is parallel to and distinct from the first plane.

9. A safety razor cartridge comprising:

- a platform having a top face, the platform comprising a

cap portion and two lateral side portions,

- at least one cutting member extending between said lateral side portions of the platform, said cutting member being supported by said platform, said cutting member being movable with respect to said platform, said platform and cutting member cooperating to guide a movement of said cutting member with respect to the platform,

- a cover having a bottom face facing the top face of the platform, the cover comprising a cap portion covering the cap portion of the platform and two lateral side portions covering the lateral side portions of the platform, and

- a plurality of discrete ultrasonic-welded bonding portions between the cover and the platform, the bonding portions being provided both at said cap portion and said lateral side portions of the cover.

10. A cartridge according to claim 9, wherein the cover is provided having its two lateral side portions partially covering the cutting members, and wherein the cutting members are biased in abutment with the lateral side portions of the cover.

11. A cartridge according to any one of claims 9 and 10, wherein the cutting members comprise a razor blade fixed on a L-shape metallic support.

12. A cartridge according to any one of claims 9 to 11, wherein the cover and the platform have mechanical guiding features of complementary shapes, adapted to guide a relative displacement of the cover and platform toward one another.

13. A safety razor cartridge according to any one of claims

9 to 12, wherein the cap portion of the cover is provided with the bonding portions in a first plane, wherein the side portions of the cover are provided with the bonding portions in a second plane,

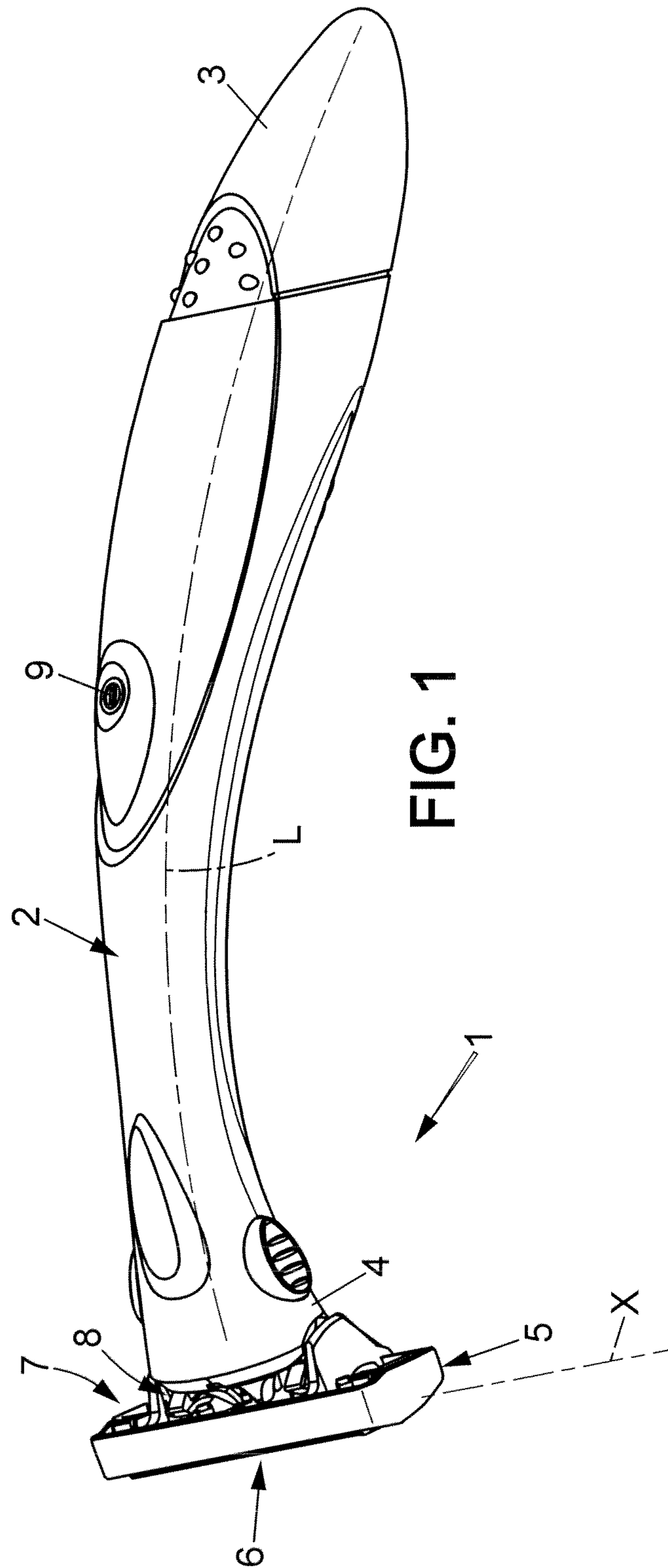
wherein said second plane is parallel to and distinct from the first plane.

14. A safety razor cartridge according to any one of claims 9 to 12, wherein the cap portion of the platform is provided with the bonding portions in a first plane, wherein the side portions of the platform are provided with the bonding portions in a second plane,

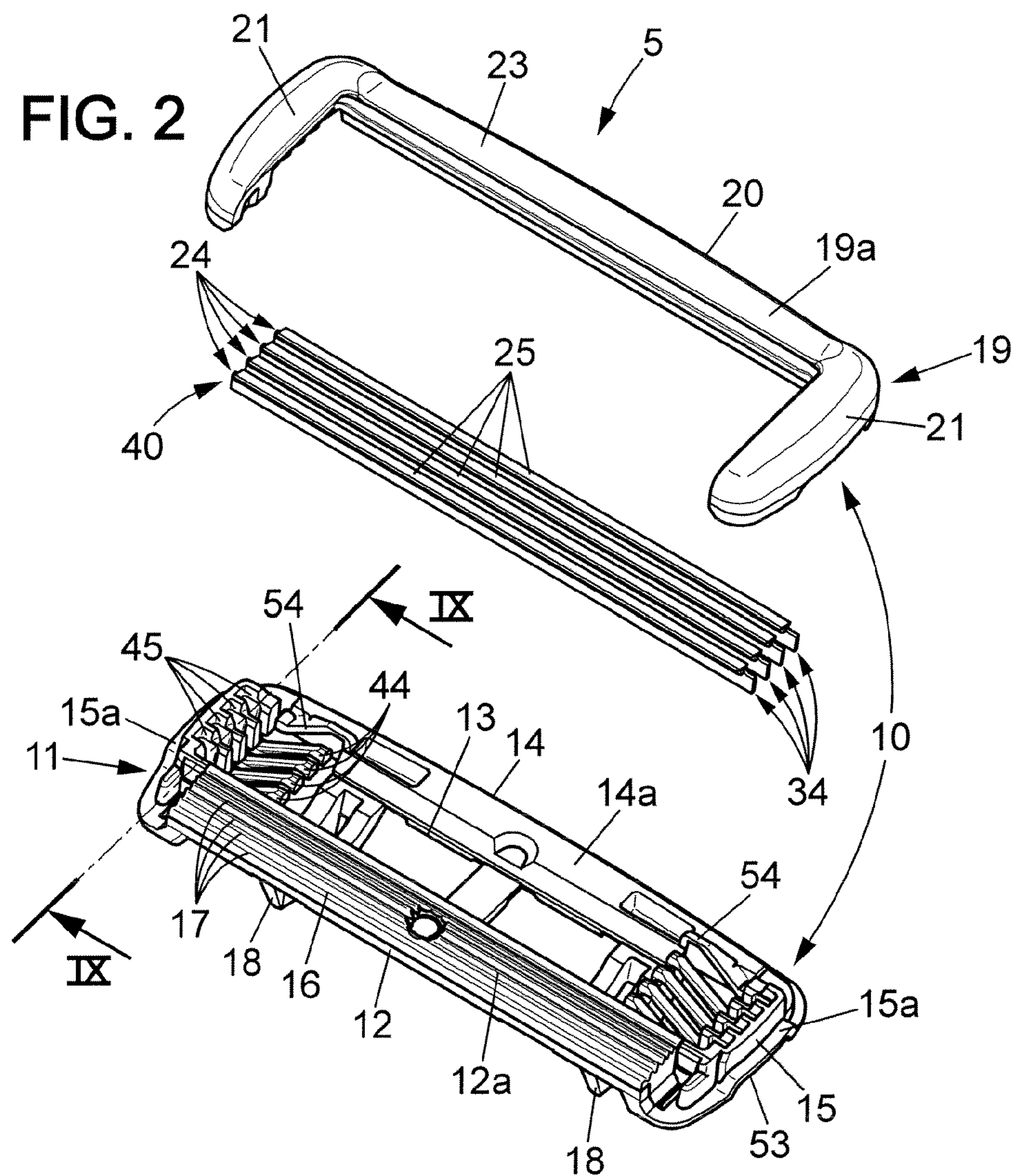
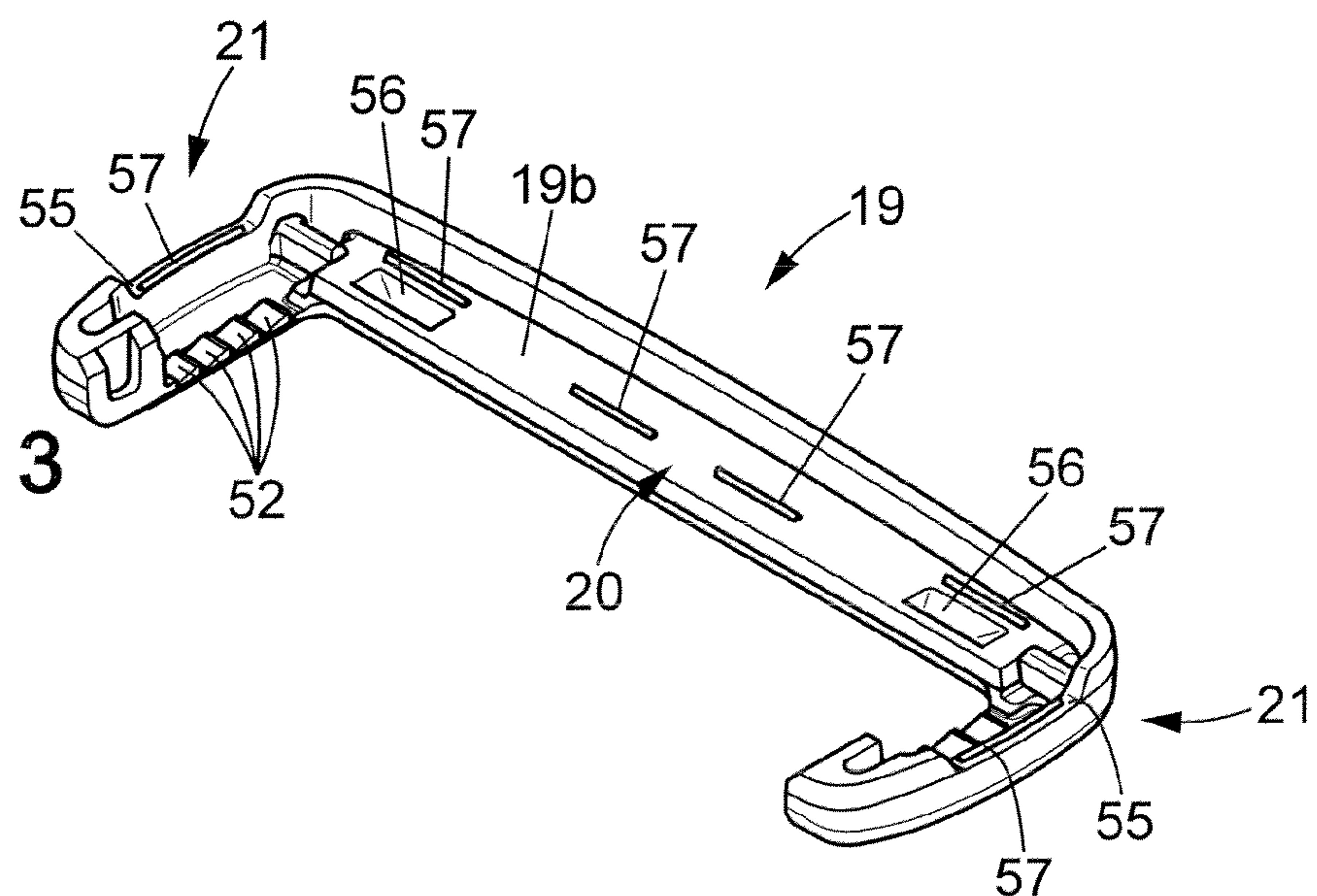
wherein said second plane is parallel to and distinct from the first plane.

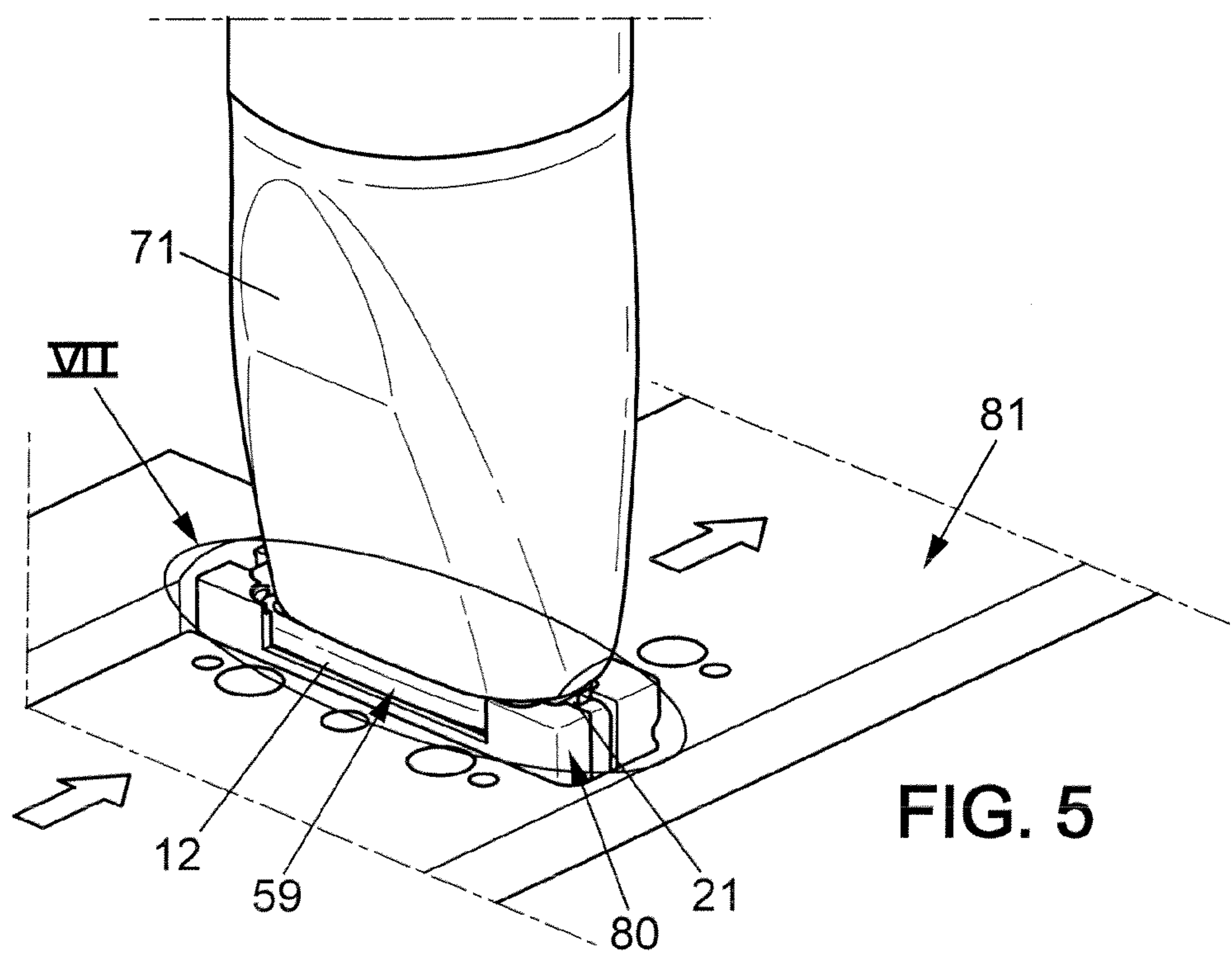
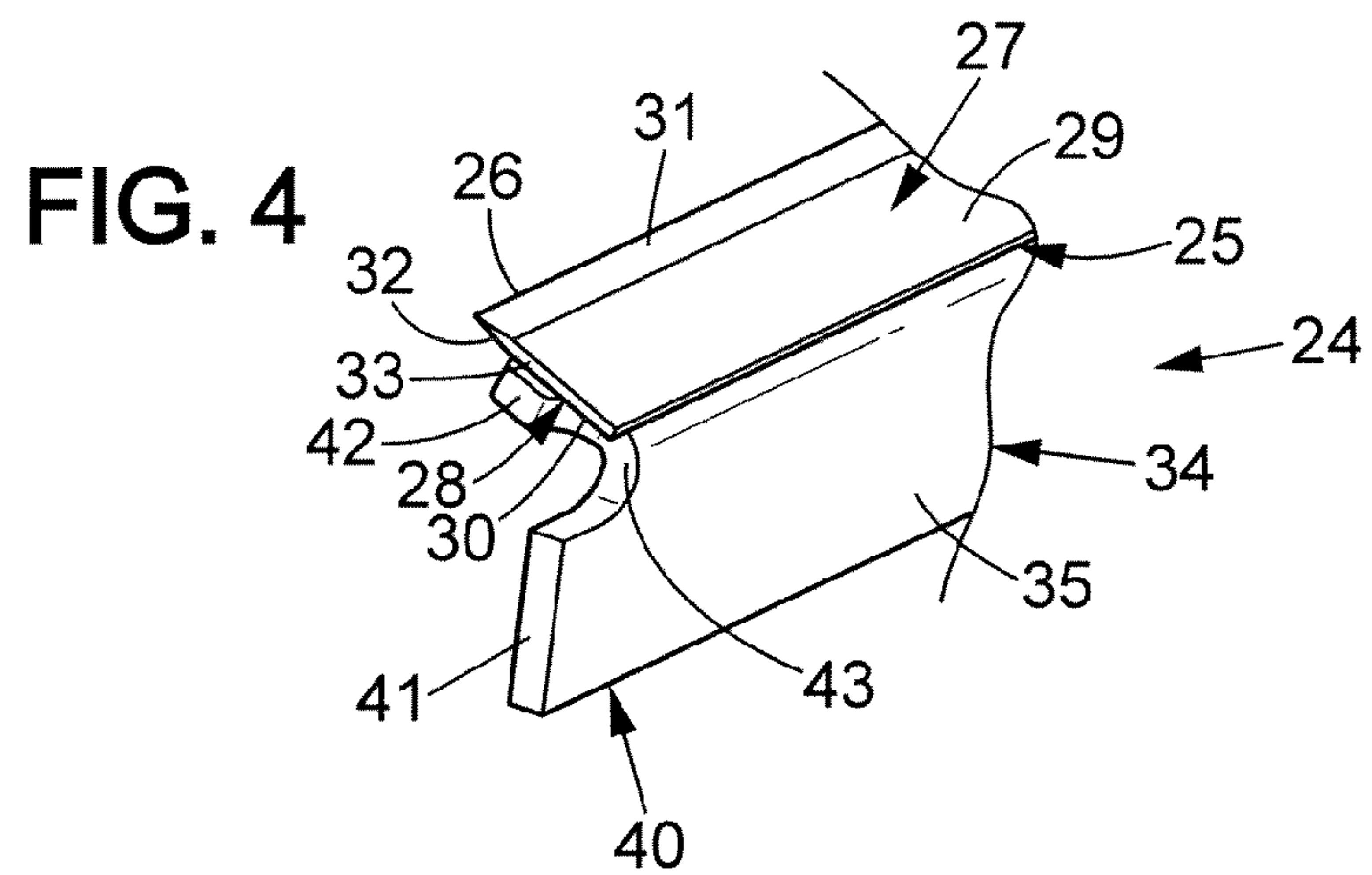
15. A safety razor comprising a cartridge according to any one of claims 9 to 14.

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2/6

FIG. 2**FIG. 3**



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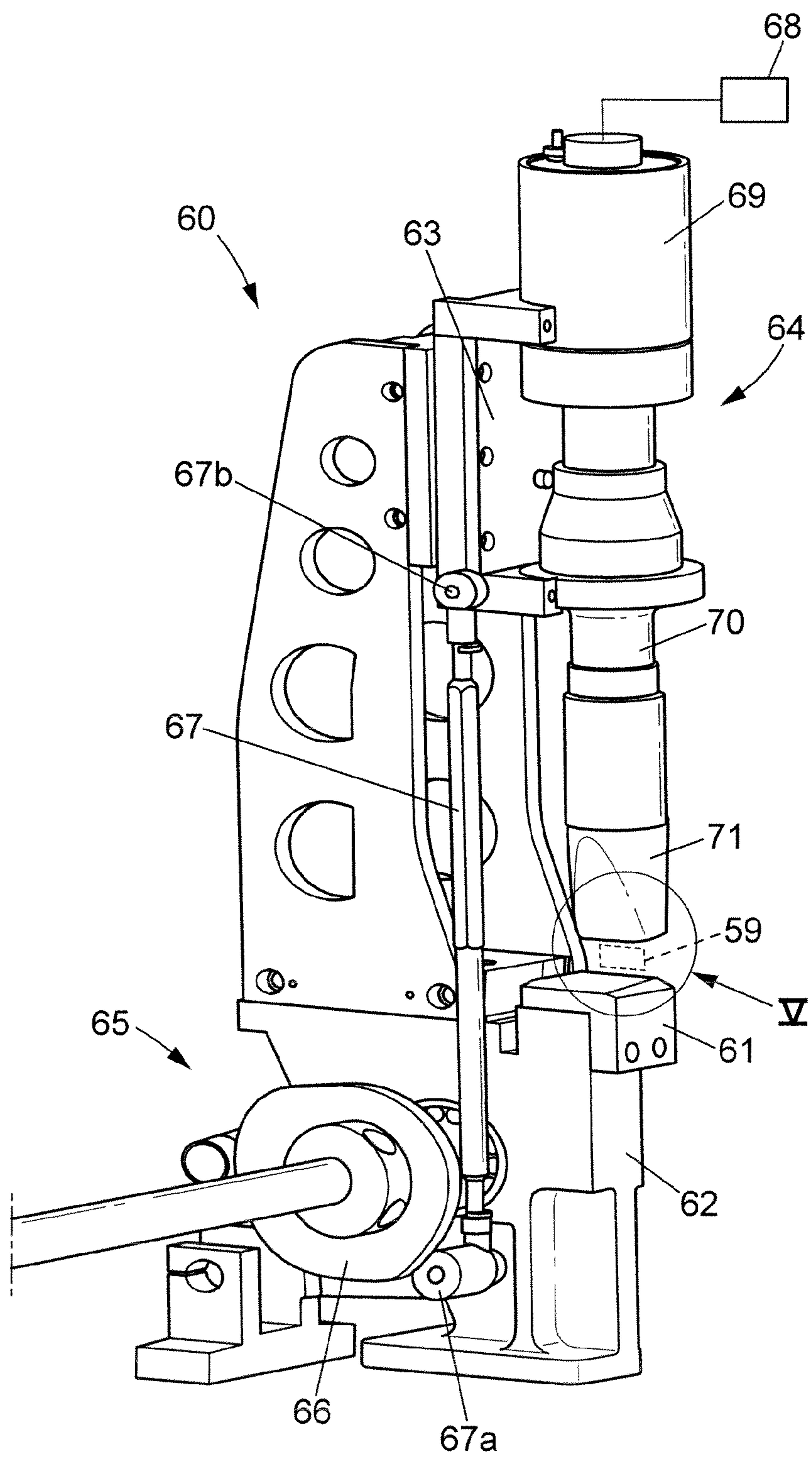
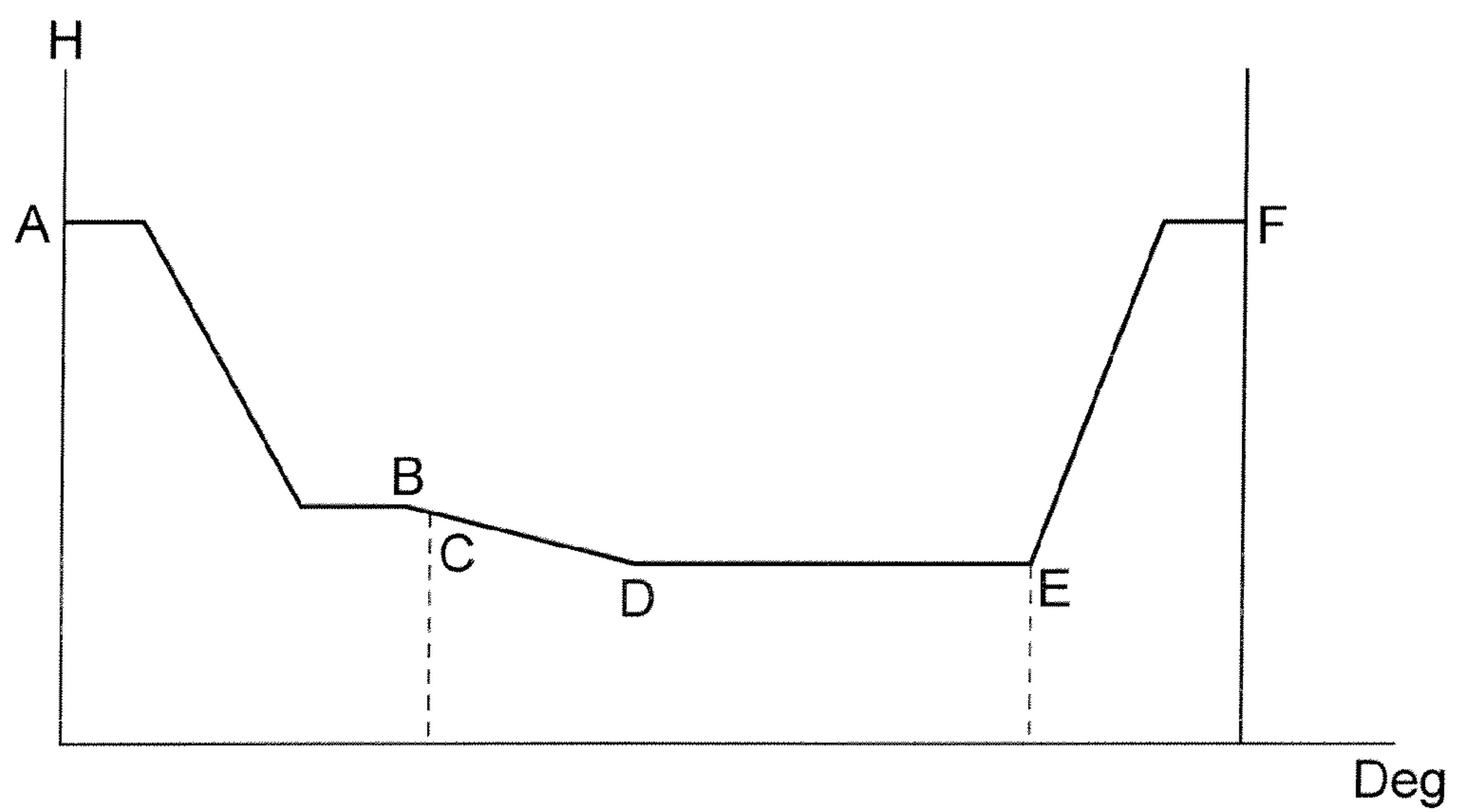
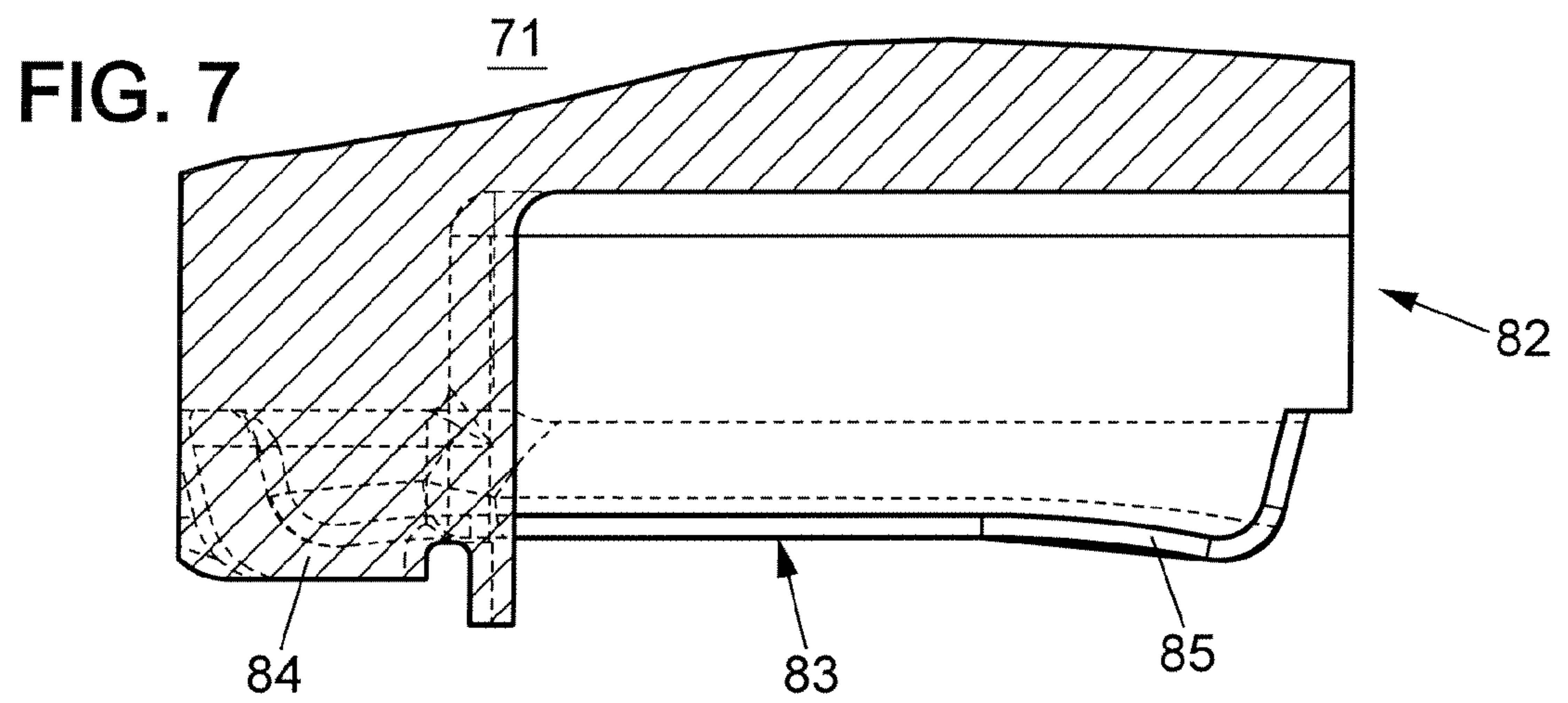


FIG. 6

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**FIG. 8**

6/6

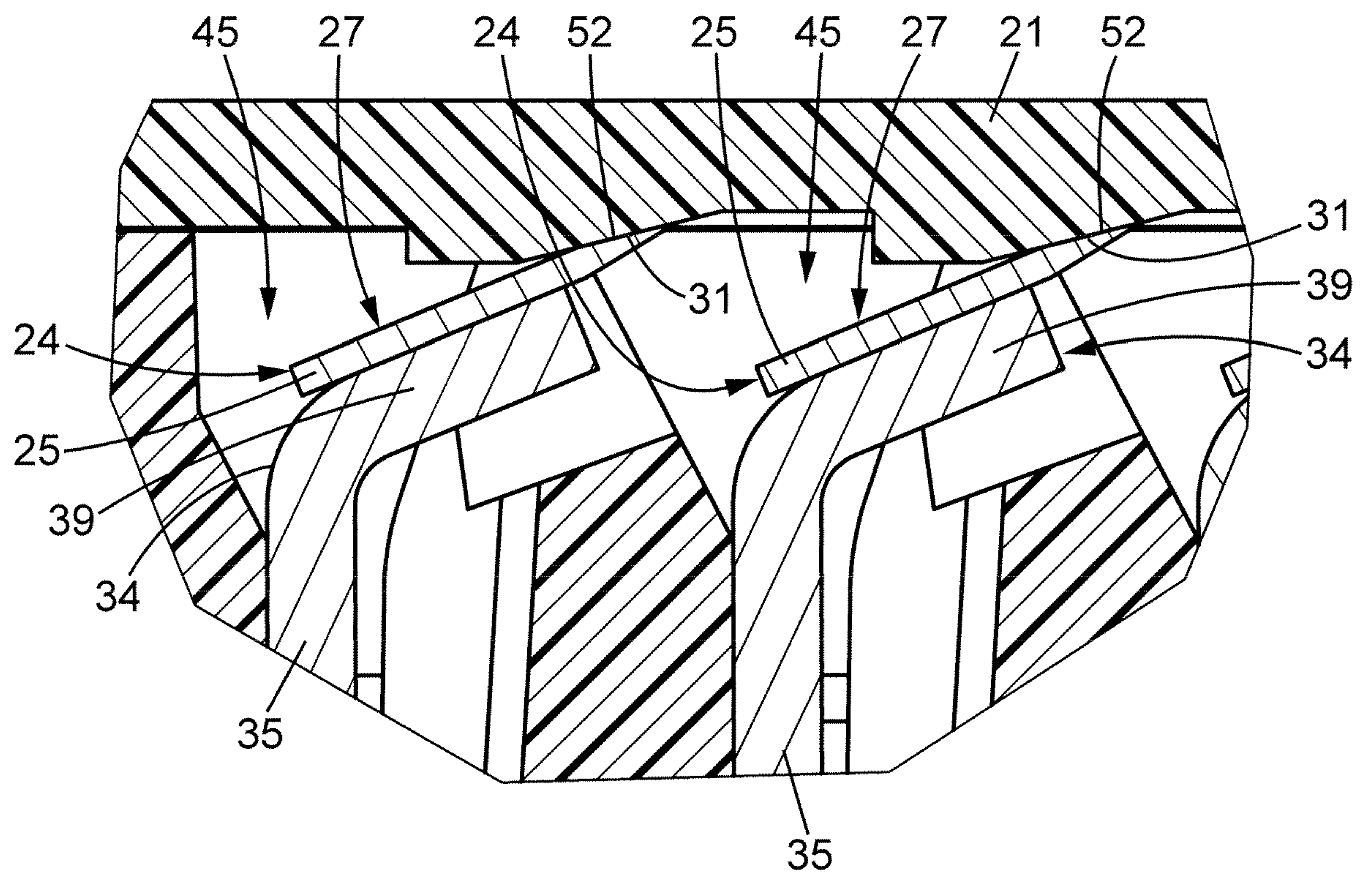


FIG. 9

