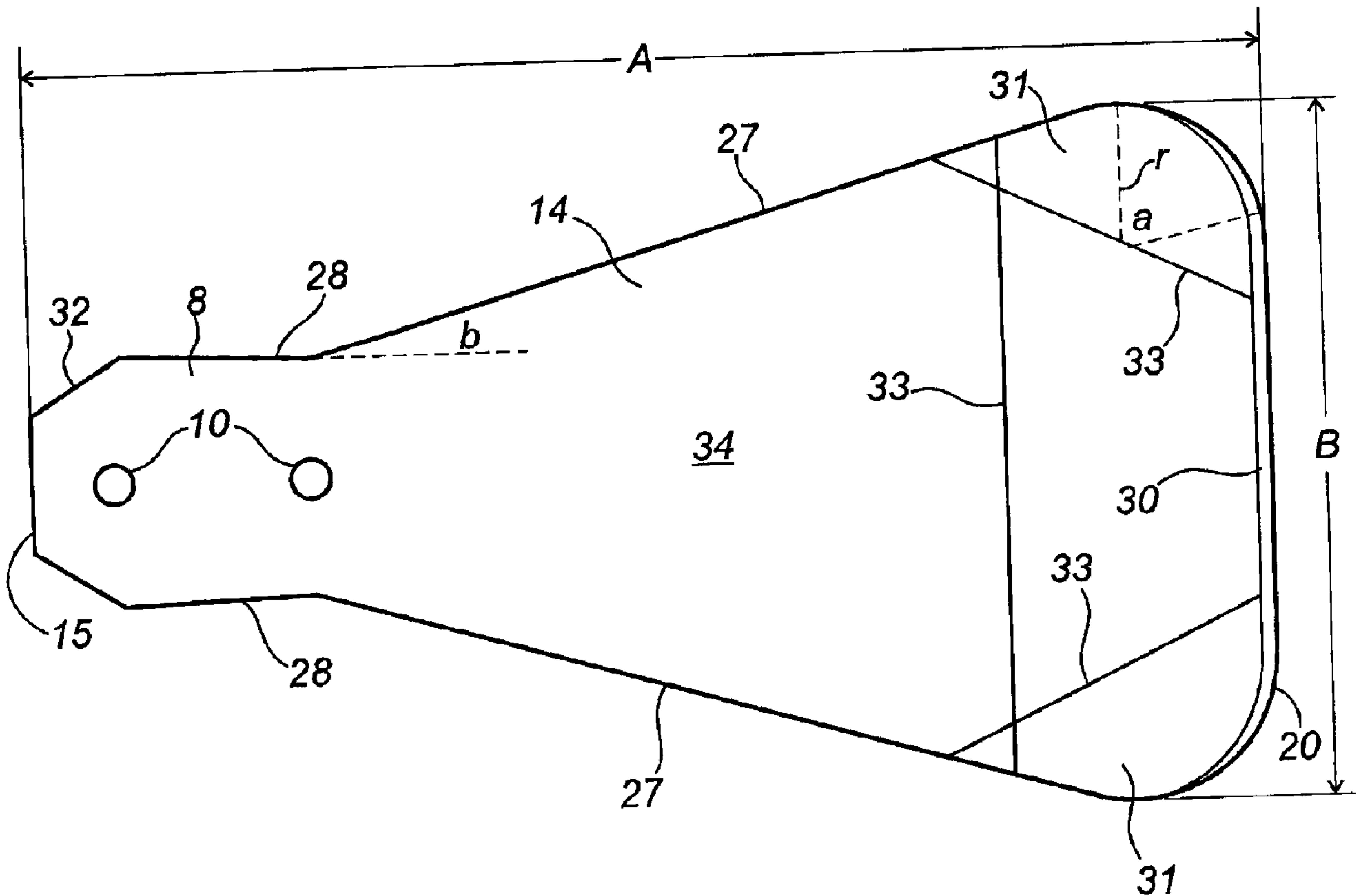




(22) Date de dépôt/Filing Date: 2006/04/28
(41) Mise à la disp. pub./Open to Public Insp.: 2007/10/28
(45) Date de délivrance/Issue Date: 2009/09/08

(51) Cl.Int./Int.Cl. *B26D 1/10* (2006.01),
B26B 7/00 (2006.01), *B26B 9/02* (2006.01),
B60S 5/00 (2006.01), *B62D 65/00* (2006.01)
(72) Inventeur/Inventor:
OGSTON, ALFRED JOHN, CA
(73) Propriétaire/Owner:
CRYSTAL GLASS CANADA LTD., CA
(74) Agent: MCKAY-CAREY & COMPANY

(54) Titre : ENSEMBLE ET METHODE DE DEPOSE DE PARE-BRISE, ET LAME ASSOCIEE
(54) Title: WINDSHIELD REMOVAL ASSEMBLY, METHOD AND BLADE FOR SAME



(57) Abrégé/Abstract:

A windshield removal assembly, method and blade for same, with the thin metal blade having a unique delta-shape. The blade connects at its narrowed shank portion to the shaft of a reciprocating power tool. The blade has front and rear ends, the front end being substantially straight and wider than the blade rear end. The blade has substantially straight side edges which narrow from

(57) **Abrégé(suite)/Abstract(continued):**

the front end to the rear end to about the width of the shaft. Arc portions are formed between the front end and each side edge of the blade. The top edge of the blade forms a non-sharpened top edge on the front end and arc portions, while the bottom edge of the blade forms a sharpened bottom cutting edge which extends across the front end of the blade and along at least half of the arc portions. The blade has sufficient rigidity to cut the urethane bed when reciprocated, and sufficient lateral flexibility to conform to the curved surface of the windshield when pressed thereagainst. The large arc portions, combined with the sharpened cutting edge extending substantially around the arc portions, improve cutting in a generally continuous lateral movement, especially around corners. The straight side edges preferably join the shank at a reduced angle to strengthen the blade, allowing it to be made in greater lengths without breakage.

ABSTRACT

1
2 A windshield removal assembly, method and blade for same, with the thin metal blade
3 having a unique delta-shape. The blade connects at its narrowed shank portion to the shaft of a
4 reciprocating power tool. The blade has front and rear ends, the front end being substantially
5 straight and wider than the blade rear end. The blade has substantially straight side edges which
6 narrow from the front end to the rear end to about the width of the shaft. Arc portions are formed
7 between the front end and each side edge of the blade. The top edge of the blade forms a non-
8 sharpened top edge on the front end and arc portions, while the bottom edge of the blade forms a
9 sharpened bottom cutting edge which extends across the front end of the blade and along at least
10 half of the arc portions. The blade has sufficient rigidity to cut the urethane bed when
11 reciprocated, and sufficient lateral flexibility to conform to the curved surface of the windshield
12 when pressed thereagainst. The large arc portions, combined with the sharpened cutting edge
13 extending substantially around the arc portions, improve cutting in a generally continuous lateral
14 movement, especially around corners. The straight side edges preferably join the shank at a
15 reduced angle to strengthen the blade, allowing it to be made in greater lengths without breakage.

1 **WINDSHIELD REMOVAL ASSEMBLY, METHOD AND BLADE FOR SAME**

2 **FIELD OF THE INVENTION**

3 This invention relates to a windshield removal assembly for cutting the urethane bed
4 around the windshield perimeter and separating the glass windshield from the vehicle. The
5 invention also relates to a method of removing a windshield with the assembly, and to a blade for
6 use in the assembly.

7 **BACKGROUND OF THE INVENTION**

8 In the process of securing a glass windshield to a new car or truck, the manufacturer first
9 extrudes a bead or "bed" of urethane onto the "pinch weld" extending around the perimeter of the
10 window opening. The urethane bed bonds to the pinch weld surface. The glass windshield then is
11 seated on the bed and bonds to it, forming a liquid-tight seal. The urethane bed is hard and tough
12 and not easily penetrated. It commonly has a thickness of about 1/4 inch and width of about 1/3 -
13 3/4 inches, widening to about 3½ - 4" or more at the corners.

14 If the windshield is to be replaced, an installer severs the bed along its length, just
15 beneath the inside surface of the glass, leaving the base portion of the bed in place. He then
16 primes the cut surface of the bed, deposits a new bead of urethane on the primed surface and
17 seats the replacement windshield onto the fresh bead to bond it in place.

18 Up to about the end of the 1980's installers used a manually operated knife to sever the
19 urethane bed. The knife was generally L-shaped, having a narrow sharpened blade and a shank or
20 handle equipped with hand grips. The installer would first work the point of the blade inwardly to
21 penetrate the bed and would then reciprocate the blade with short in and out strokes while pulling
22 the blade sideways to saw through the urethane bed along its length. Commencing about 1990,
23 two types of powered tools were introduced commercially, to replace the manually operated

1 tools. These powered tools mimicked the manually operated knife in several structural and
2 operational respects. The first type of tool involved an L-shaped blade and shank powered by an
3 electric motor. The blade was oscillated from side to side. The blade was pointed at its end and
4 narrow (about 1/2 inch wide), to facilitate initial manual penetration. The side edge of the blade
5 was sharpened, so that a lateral cutting action was produced. The second type of tool involved
6 reciprocating a blade which would extend in and out of a sleeve. The blade was actuated by an
7 electric motor. Again, the blade was pointed and narrow (about 1/2 inch width), to facilitate
8 initial penetration. The "throw" or distance advanced by the blade was short, about 1/2 inch.

9 In use, these tools were characterized by several problems. More particularly:

- 10 • Cutting with them was slow.
- 11 • The depth and width of the cut were small, requiring a great many cuts to complete the
12 job.
- 13 • Typically it would take about 15-20 minutes to cut the windshield free.
- 14 • Using the prior art assemblies was laborious. The installer would have to apply a
15 sideways pull to these tools, particularly when cutting along the horizontal legs of the
16 bed.
- 17 • It was common to crack the glass when first penetrating the bed. This could leave broken
18 glass on the dash and elsewhere, which was undesirable.
- 19 • The cuts made by the tools were shallow. One could only cut into the bed with these tools
20 about 1/2 inch at a time. This meant that at the corners, where the bed width was greatest,
21 it would take prolonged cutting to complete severing the bed. In practice, the installer
22 would revert to using a hand knife at the corners or would break off the glass at the
23 corners and have to later complete the cut by hand of the corner urethane with its
24 embedded glass.
- 25 • In the course of hand cutting the corners, the installer would commonly press hard with
26 his head against the windshield to assist his cutting - this was known to lead to neck
27 injuries.
- 28 • The cut surface produced by the blades of these powered tools was irregular, tagged and

1 undulating. This was undesirable as the newly extruded bead would in part reproduce
2 this underlying irregularity and the new windshield would then not seat flush against the
3 bed surface. This could lead to a poor seal and subsequent leaking.

- 4 • The electric motor-driven tools of the prior art were generally bulky and difficult to work
5 with in confined space, such as the apex between the vehicle dashboard and the inside
6 surface of the windshield.
- 7 • The prior art blades were fragile and expensive - breakage was a problem.
- 8 • It was necessary to use soapy water as a coolant and lubricant for the narrow, rapidly
9 moving blades. After the cut was complete, the cut surface needed to be carefully washed
10 to remove soap, as it was detrimental to getting a good bond when new urethane was laid
11 on to the old bed.

12 Against this backdrop, the present inventor invented a windshield removal assembly
13 including a modified reciprocating air gun which attached through a shaft to a unique, bell-
14 shaped blade design which was wide at its front end and narrowed toward its rear (shank) end.
15 The shank was connected to the reciprocating shaft of the air gun. This assembly and method of
16 using same are described in U.S. Patent No. 6,862,968, issued March 8, 2005 to Ogston, and U.S.
17 Published Patent Application No. 2005/0126359, published June 16, 2005, also to Ogston.

18 While the above Ogston assembly was a marked improvement over many of the other
19 prior art devices, it presented its own unique issues, as follows:

- 20 • The sharp corner edges at the front end of the blade could cause damage to either or both
21 of the pinch weld of the vehicle holding the windshield, or to the dashboard or upholstery
22 of the vehicle.
- 23 • Due to the extreme flexing requirements for the blade during use against the windshield,
24 including twisting motions, the blade could break at the stress point between the bell
25 shaped side edges of the blade and the straight shank side edges where the blade
26 connected to the shaft.
- 27 • Penetration of the urethane bed, particularly at the corners where the bed is deepest, was

1 sometimes still difficult.

- 2 • Cutting around the corners of the windshield presented some difficulty, with the sharp
3 corners limiting movement around the corner.
- 4 • Cutting was primarily in the vertical (i.e., forward) direction, as the front end of the blade
5 cut into the urethane bed. To move the blade along, particularly in the wider urethane bed
6 at the bottom of the windshield, the installer would reposition the blade for each new cut
7 into the urethane bed. While the wider blade made the operation much faster than with
8 the prior art designs, it still took several minutes to remove the windshield.
- 9 • In some newer vehicle designs the urethane bed has become wider as the windshield have
10 moved to more aerodynamic designs. The bell-shaped blades could not be simply
11 elongated to accommodate the needed deeper penetration without the blade becoming too
12 fragile when flexed, i.e., if elongated beyond about 7.75 inches, the bell-shaped blades
13 would break at their stress point (i.e., where the blade side edges joined to the shank).
- 14 • The air gun, while suitable for some applications, did not meet all customer needs.
15 Cordless and electrical power units were also desirable.

16 Canadian Patent Application No. 2,305,821, published October 21, 2001 (now
17 abandoned) to Hogg, describes a spade-shaped cutting blade similar to that of U.S. Patent
18 6,862,968, for use with a reciprocating air gun. The front of the blade is shown to be slightly
19 rounded, removing the sharp corners of the blade. As well, the blade is described as having an
20 “offset” relative to the shaft of the air gun. To achieve the 90 ° offset, the blade is mounted on
21 one flattened side of the shaft of the blade. This is stated to better support the blade against
22 breakage at the shank. In the experience of the present inventor, simply “rounding” the corners
23 of its own bell-shaped blade (U.S. Patent 6,862,968) did not provide for clean continuous lateral
24 cutting with the blade. As well, the “offset” mounting of the blade is not believed to allow the
25 blade to be elongated without breakage at the stress point, as described above. Thus, to the
26 present inventor’s knowledge, the blade design of CA Patent Application 2,305,821 was never
27 commercialized, nor is it believed to adequately answer the issues listed hereinabove with the
28 bell-shaped blades of U.S. Patent 6,862,968.

1 In order to strengthen the blade against breakage at the stress point where the blade side
2 edges meet the shank, particularly for blades longer than 6 inches, the invention preferably
3 includes a further blade design feature as follows: the blade shank portion is formed with spaced
4 shank side edges substantially parallel with the shaft, and the blade side edges meet the shank
5 side edges at an angle between about 5 and 25 degrees. This angle is reduced over that in the
6 prior art bell-shaped blade design, and that shown in Patent Application to Hogg. With this
7 reduced angle range, blades as long as about 9 inches may be accommodated.

8 The most preferred dimensions of the delta-shaped blade of this invention will vary
9 depending on the particular application (ex. urethane bed width and apex dimensions adjacent the
10 windshield being removed) and the power tool being used (which will vary the desired blade
11 length and the shank dimensions). Preferred dimensions determined by the inventor include:

- 12 • blade length - 2.75 to 4.25 inches, most preferably 4 inches;
- 13 • blade lengths - 6 to 9 inches, most preferably 8 inches;
- 14 • radius of curvature of arc portions - 0.60 to 1.0 inches, more preferably 0.75 to 0.90, most
15 preferably 0.85 to 0.875;
- 16 • enclosed angle of arc portions - 65 to 80 degree, more preferably 70 to 75 degrees; and
- 17 • shank angle (where blade side edges meet the shank) - 5 - 25 degrees, more preferably 10
18 to 25 degrees.

19 It has been found that this combination provides a cutting assembly having the following
20 attributes:

- 21 • Blade breakage is reduced.
- 22 • Blades may be elongated without breakage when the blades are flexed, even in the lateral
23 directions.
- 24 • The longer blades allow for deeper penetration into wider urethane beds.
- 25 • The sharpened bottom cutting edge extending around the arc portions make cutting easier
26 for the installer, allowing for more continuous lateral cutting movement without
27 repositioning the blade between cuts. This results in faster windshield removal times and

1 reduced injuries to the installer.

- 2 • The sharpened arc portions make cutting around the corners of windshield easier, with
3 less damage to windshield, vehicle, and pinch mold, and leave a clean urethane bed for
4 attachment of the new windshield.

5 The invention also broadly extends to cutting blades as described above, and to a method
6 of cutting a urethane bed with the windshield removal assembly as described above. The method
7 broadly includes:

8 providing a windshield removal assembly as defined above;

9 positioning the windshield removal assembly in the apex space with the blade being
10 positioned such that the non-sharpened edge is pressed against the windshield, the blade is flexed
11 to follow the curved surface of the windshield, and the sharpened cutting edge at the front end of
12 the blade is pressed against the urethane bed;

13 reciprocating the blade with the power tool to make an initial incision into the urethane
14 bed; and

15 continuing to reciprocate the blade while moving the blade and power tool in a generally
16 continuous lateral movement using the sharpened cutting edge at both the front end and arc
17 portions of the blade to cut the urethane bed around the perimeter of the windshield.

18 Definitions:

19 As used herein and in the claims, the term "reciprocating" refers to a back and forth
20 movement along the longitudinal axis of the shaft of the power tool.

21

22 As used herein and in the claims, the word "comprising" is used in its non-limiting sense
23 to mean that items following the word in the sentence are included and that items not specifically
24 mentioned are not excluded. The use of the indefinite article "a" in the claims before an element
25 means that one of the elements is specified, but does not specifically exclude others of the
26 elements being present, unless the context clearly requires that there be one and only one of the

1 elements.

2 BRIEF DESCRIPTION OF THE DRAWINGS

3 FIG. 1 is an perspective view of a prior art windshield removal assembly showing a bell
4 shaped blade connected for reciprocation to an air gun;

5 FIG 2 is a schematic side view showing the position of the blade of the present invention
6 for cutting the urethane bed around the perimeter of a windshield;

7 FIG. 3 is a side view of the shaft attachment to the blade; and

8 FIGS. 4 - 7 are bottom plan views of four different sized blades of the present invention
9 (6, 7, 8 and 9 inch long blades respectively), showing the sharpened bottom cutting edge
10 extending across the front edge and across the arc portions adjacent the front edge, and also
11 showing the preferred feature of a reduced angle at which the blade side edges meet the blade
12 shank portion.

13 DESCRIPTION OF THE PREFERRED EMBODIMENTS

14 The windshield removal assembly 1 comprises a reciprocating power tool, such as an air
15 gun 2, shaft 3 and blade 4. FIG. 1 shows the inventor's prior art version of the windshield
16 removal assembly as described in U.S. Patent 6,862,968 and U.S. Published Application No.
17 2005/0126359, wherein the power tool is an air gun 2, the shaft 3 reciprocates in a back and forth
18 movement along the longitudinal axis of the shaft 3. The blade 4 is shown with its bell-shaped
19 configuration. The stress point mentioned above, at the joining of the side edges to the shank, is
20 shown at P.

21 The present invention is shown in FIGS. 2 - 7, with like parts, compared to the prior art

1 device of FIG. 1, being labeled with the same numerals.

2 FIG. 2 is schematic in nature, and is of assistance in describing the operation of assembly
3 of the present invention. When assembled and operated, the blade 14 preferably reciprocates
4 with a throw or travel of about $\frac{1}{2}$ inch. The blade 14 is pressed against the inside surface 22 of
5 the glass windshield 23 and is driven into the urethane bed 24. It severs the urethane bed 24 just
6 beneath the glass perimeter. With the prior art device described above, the installer would move
7 the assembly 1 along the length of the bed 24 by withdrawing the blade 4 from the urethane bed
8 24, moving it to the next adjacent cut position and then again driving the blade in. With the
9 assembly 13 of the present invention, as will be evident from this description, the newly designed
10 delta-shaped blade 14 can be moved along with continuous cutting in the lateral direction
11 through the urethane bed 24, without the need to re-position and move it for each next adjacent
12 cut. As described below, in the present invention, the large rounded corners (arc portions 31),
13 combined with the sharpened cutting edge 30 which extends a substantial distance around the arc
14 portions 31, allow the blade 14 to be moved smoothly in the lateral direction, even at the corners
15 of the windshield, for cutting in the both the vertical (i.e., forward) and lateral directions. The
16 installer can also use water without lubricant as a cooling agent while cutting the urethane bed
17 24.

18 Suitable reciprocating power tools are commercially available to deliver high impact
19 strokes with about a $\frac{1}{2}$ inch throw. These power tools may be modified to provide a suitable
20 shaft 3 to retain the blade 14, and to space the blade sufficiently from the power tool in order to
21 fit within the narrow vehicle apex adjacent the windshield. For instance, for an air gun, a
22 Chicago Pneumatic model # CP715 gun is suitable. Suitable cordless power tools include, for
23 example, a Milwaukee Max 18 (18 volt), DeWalt 18 volt, or DeWalt 24 volt Brute model. A
24 suitable electric power tool is, for example, a Milwaukee 120 volt model. Shaft dimensions will
25 vary with the particular application and power tool, but will generally range from 5 to 13 inches
26 in length, and 0.70 to 0.80 inches in diameter (at the shaft outer end 6).

27

1 Turning to FIG. 3, the shaft 3 is shown as a 3/4 inch diameter steel rod having an inner
2 end 5 conventionally shaped to connect with the air gun 2 (or other power tool). At its outer end
3 6, a slot 7 extends inwardly to receive the shank portion 8 formed at the rear end 15 of the blade
4 14. The upper surface of the rod end 6 forms a recess 9. The rod end 6 further forms bolt holes
5 10 extending transversely therethrough. Nuts 12 and bolts 11 are received in the recess 9 and
6 holes 10 to secure the blade shank 8 to the rod end 6.

7 The blade 14 is formed of thin metal, preferably stainless steel, and has a width at the
8 front end 20 which is significantly wider than the width of its rear end 15. Preferably the front
9 end 20 has a width in the range of about 2.75 to 4.25 inches, most preferably about 4 inches,
10 measured as shown for dimension B in FIG. 5. The preferred length of the blade 14, shown as
11 dimension A in FIG. 5 is 6 - 9 inches, with 8 inches being most preferred. The shank 8 is shown
12 to include squared off corners 32 to prevent sharp corners. The blade thickness is preferably
13 about 0.05 inches, tapering to 0.025 inches at the sharpened cutting edge 30. While it is
14 substantially rigid, it also has sufficient lateral flexibility so that it will conform to the windshield
15 curvature when pressed thereagainst. The blade shank 8 is generally sized to be close to the
16 dimensions of the shaft 3. As shown in the preferred blades sizes of FIGS. 4 - 7 (lengths 6, 7, 8
17 and 9 inches respectively), the shank 8 has substantially parallel side edges 28. These side edges
18 28 are shown as being most preferably spaced apart by 1.375 inches, and the shank length is most
19 preferably 1.5625 inches. This shank length (measured from the midpoint of the front most hole
20 10 to the rear end 15 of the blade) is reduced compared to the prior art bell-shaped blade, such
21 that the shaft outer end 6 extends slightly past the blade end of the shank 8. This increases both
22 the strength and support for the shank 8 at this point. As mentioned, these shank dimensions
23 may vary with the diameter of the shaft 3, which in turn varies with the particular power tool
24 being used to reciprocate the blade 14.

25 Unlike the bell-shaped blades 4 of the prior art, the blade 14 of this invention has straight
26 side edges 27 between the arc portions 31 and the shank 8. The side edges 27 narrow the blade
27 14 from its front to rear ends 20, 15. The blade front end 20 is beveled on one side only to

1 produce a top non-sharpened edge 29 which bears against the glass of the windshield without
2 damaging the windshield, and a bottom sharpened cutting edge 30 which penetrates the urethane
3 bed 24 when the assembly 13 is in use. Between the blade front end 20 and the side edges 27,
4 are formed arc portions 31, each having a radius of curvature "r" of between 0.60 and 1.0 inches,
5 more preferably 0.75 to 0.90, and most preferably 0.85 to 0.875. The arc portions 31 are of
6 significant size, and are not a mere "rounding off" of the corners, as suggested by the prior art.
7 The angle enclosed by the arc portions 31 is shown as angle "a" in FIG. 5. This angle "a" is
8 preferably in the range of 65 to 80 degrees, more preferably 70 to 75 degrees. Importantly, the
9 sharpened bottom cutting edge 30 extends continuously across the front end 20 of the blade 14,
10 and at least across half of the arc portions 31. More preferably the cutting edge 30 extends
11 completely across the arc portions 31, as shown in FIGS. 4 - 7.

12 These combined features at the front of the blade 14 (the large arc portions 31 and the
13 cutting edge 30 extending substantially around the arc portions 31) provide the blade 14 with the
14 ability to cut in a continuous lateral manner for a majority of the windshield, without having to
15 reposition the blade between each cut. The sharpened arc portions 31 also allow the blade 14 to
16 be maneuvered in cutting mode around the corners of the windshield without difficulty, and
17 without damaging the pinch weld, the windshield or the vehicle. These combined features
18 significantly ease the cutting operation, reduce the time to remove a windshield, and allow the
19 blade 14 to be used in elongated forms in the wider urethane beds of today's vehicles.

20 As shown in FIGS. 4 - 7, the shank portion 8 of the blade includes parallel spaced side
21 edges 28, spaced apart by about the width of the shaft 3. At the point where the shank edges 28
22 meet the blade side edges 27 there is stress in the blade, particularly as it is laterally flexed in
23 operation. To strengthen the blade 14 at this stress point P, the angle "b" at which the shank
24 edges 28 meet the blade side edges 27 is reduced to be within the range of 5 to 25 degrees. This
25 angle b is generally at the smaller end of the range for the longer blades (FIG. 7 shows a 9 inch
26 blade) and with blades having smaller widths at their front edges. The angle "b" is generally at
27 the higher end of the range for the shorter blades (FIG. 6 shows a 6 inch blade) and with blades

1 having the wider widths at their front edges (FIGS. 4 - 7 show 4 inch width blades). By reducing
2 the shank angle "b" as described, much longer blades may be produced (up to 9 inches) than was
3 possible with the prior art bell-shaped blades (limited to about 7.75 inches).

4 This reduced shank angle "b" is significantly less than that of U.S. Patent to Ogston, and
5 CA Patent Application to Hogg, which show shank angles greater than about 30 degrees. As
6 well, the arc portions 31 are much larger, and sharpened compared to those of the Hogg Patent
7 Application, enabling cutting around the windshield corners, and continuous cutting in a lateral
8 direction, using the sharpened cutting edge 30 on both the front end and the arc portions.

9 Also as shown in FIGS. 4 - 7, the blade 14 is preferably provided with score lines 33 on
10 its bottom surface 34 to show the maximum insertion depths into the urethane bed 24. Being
11 located on the bottom of the blade, these guidelines 33 remain visible to the installer during
12 operation, and serve to protect the pinch weld 25 against damage.

13 All publications mentioned in this specification are indicative of the level of skill in the
14 art of this invention. The terms and expressions used are, unless otherwise defined herein, used
15 as terms of description and not limitation. There is no intention, in using such terms and
16 expressions, of excluding from the claims, equivalents of the features illustrated and described.
17 A person skilled in the art could make immaterial modifications to the invention described in this
18 patent document without departing from the essence of the invention. Although the best mode
19 contemplated for carrying out the present invention has been herein shown and described, it will
20 be apparent that modification and variation may be made without departing from what is
21 regarded to the subject matter of the invention, as defined in the claims.

1 CLAIMS:

2 1. A windshield removal assembly for cutting a urethane bed securing the perimeter of a
3 glass windshield to a vehicle at an edge of a windshield opening formed by the vehicle, wherein
4 the windshield has a curved surface and wherein there is a narrowing apex space between the
5 windshield and a vehicle part forming the windshield opening, the assembly comprising:

6 a reciprocating power tool;

7 a cutting blade;

8 a rigid elongated shaft having inner and outer ends, the inner end being adapted for
9 connection with the power tool for reciprocation thereby, and the outer end being adapted for
10 connection to the cutting blade;

11 the cutting blade being a flat, thin metal blade having:

12 front and rear ends, the blade front end being substantially straight and
13 being wider than the blade rear end, the blade rear end being adapted for
14 connection through a shank portion of the blade to the shaft's outer end such that
15 the blade is held substantially co-planar with the shaft;

16 straight side edges which narrow from the front end to the rear end to
17 about the width of the shaft,

18 an arc portion between the front end and each side edge, the arc portion
19 having a radius of curvature between about 0.60 and 1.0 inches;

20 a non-sharpened top edge on the front end and arc portions, the top edge
21 being configured such that it can be pressed against the windshield;

22 a sharpened bottom cutting edge formed on and extending across the
23 bottom edge of the front end of the blade and along the bottom edge of at least
24 half of the arc portions adjacent the front end, the cutting edge being sufficiently
25 sharp to penetrate the urethane bed when reciprocated with sufficient force from
26 the power tool; and

27 sufficient rigidity to cut the urethane bed when reciprocated, but
28 sufficiently lateral flexibility to conform to the curved surface of the windshield

1 when pressed thereagainst; and
2 the shaft having a length sufficient to space the blade from the power tool to allow the
3 assembly to be operated within the confines of the apex space.

4 2. The assembly of claim 1, wherein the blade shank portion has spaced shank side edges
5 substantially parallel with the shaft, and wherein the blade side edges meet the shank side edges
6 at an angle between 5 and 25 degrees.

7 3. The assembly of claim 1 or 2, wherein the blade has a length of about 6 to 9 inches, a
8 blade width at its widest point of about 2.75 to 4.25 inches, and a radius of curvature of about
9 0.75 to 0.90 inches, wherein the arc portions each enclose an angle of about 65 to 80 degrees, and
10 wherein the sharpened cutting edge extends around substantially the entire edge of the arc
11 portions.

12 4. The assembly of claim 1, 2 or 3, wherein the radius of curvature is about 0.85 to 0.875,
13 the arc portions each enclose an angle of about 70 to 75 degrees, and the blade side edges meet
14 the shank side edges at an angle between 10 and 25 degrees.

15 5. The assembly of any one or claims 1 - 4, wherein the blade is about 7 to 9 inches in
16 length, and has a blade width at its widest point of about 4 inches.

17 6. The assembly of any one of claims 1 - 5, wherein the blade shank portion has a length
18 that allows that outer end of the shaft, when connected to the blade, to extend forwardly beyond
19 the point where the blade side edges meet the shank side edges to increase strength and support
20 for the blade.

21 7. The assembly of any one of claims 1 - 6, wherein the blade is formed with one or more
22 guidelines on the bottom of the blade spaced from the bottom cutting edge to show a maximum
23 insertion depth of the blade during operation.

1 8. A blade as defined in any one of claims 1 - 7.

2 9. A method of cutting a urethane bed securing the perimeter of a glass windshield to a
3 vehicle at the edge of a windshield opening formed by the vehicle, wherein the windshield has a
4 curved surface and wherein there is a narrowing apex space between the windshield and a vehicle
5 part forming the windshield opening, the method comprising:

6 providing a windshield removal assembly as defined in any one of claims 1 - 7;

7 positioning the windshield removal assembly in the apex space with the blade being
8 positioned such that the non-sharpened edge is pressed against the windshield, the blade is flexed
9 to follow the curved surface of the windshield, and the sharpened cutting edge at the front end of
10 the blade is pressed against the urethane bed;

11 reciprocating the blade with the power tool to make an initial incision into the urethane
12 bed; and

13 continuing to reciprocate the blade while moving the blade and power tool in a generally
14 continuous lateral movement using the sharpened cutting edge at both the front end and arc
15 portions of the blade to cut the urethane bed around the perimeter of the windshield.

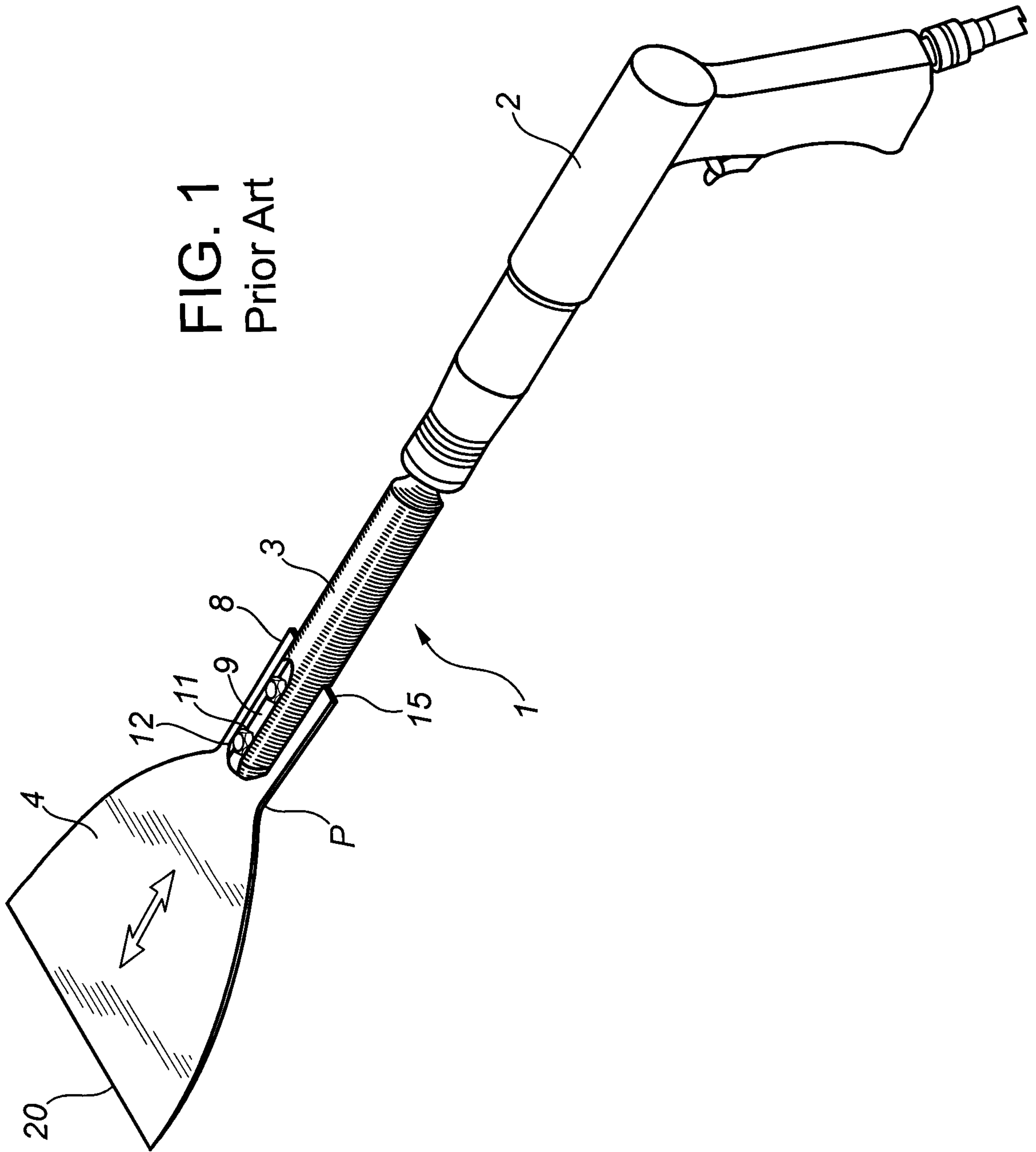


FIG. 1
Prior Art

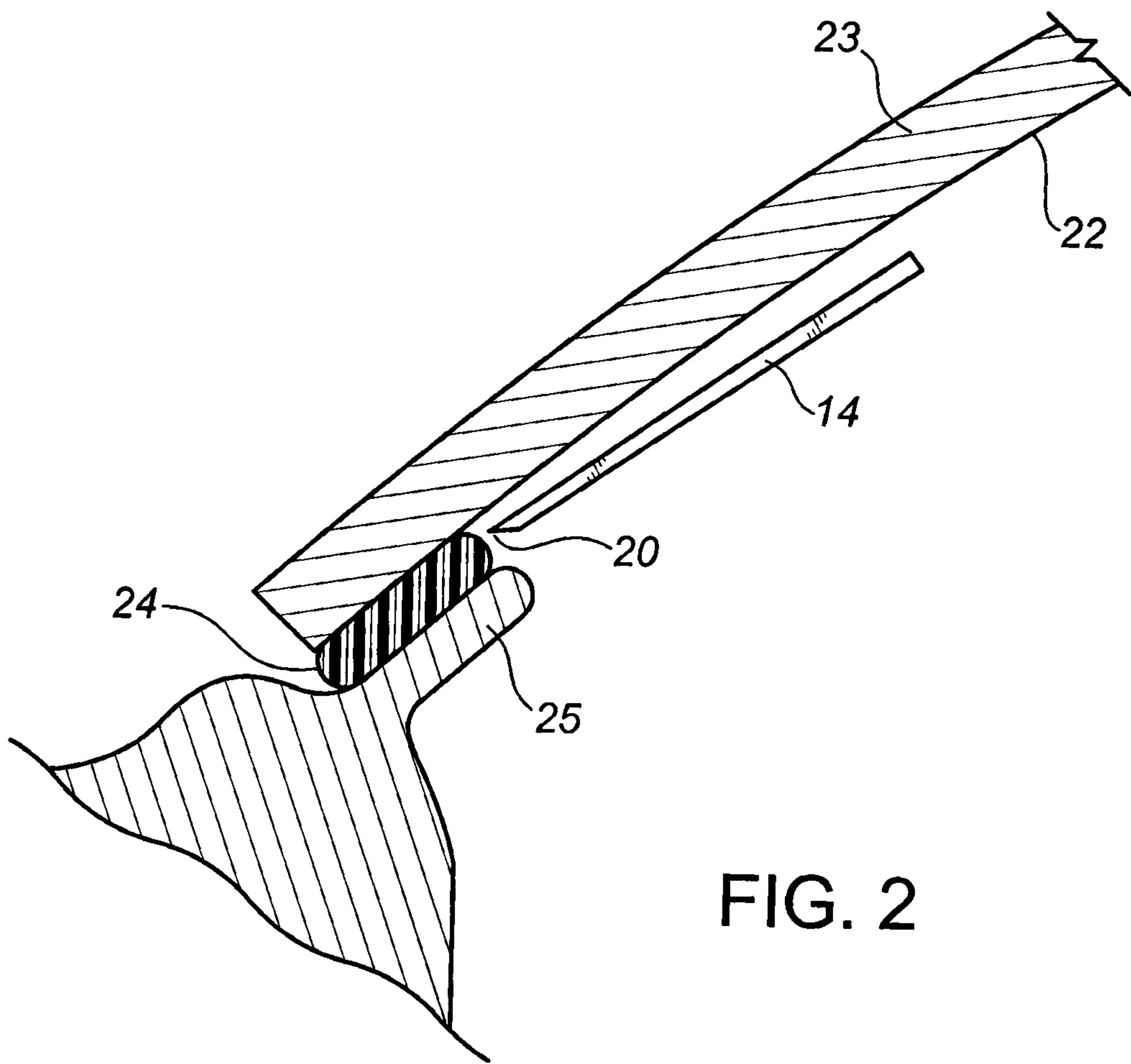
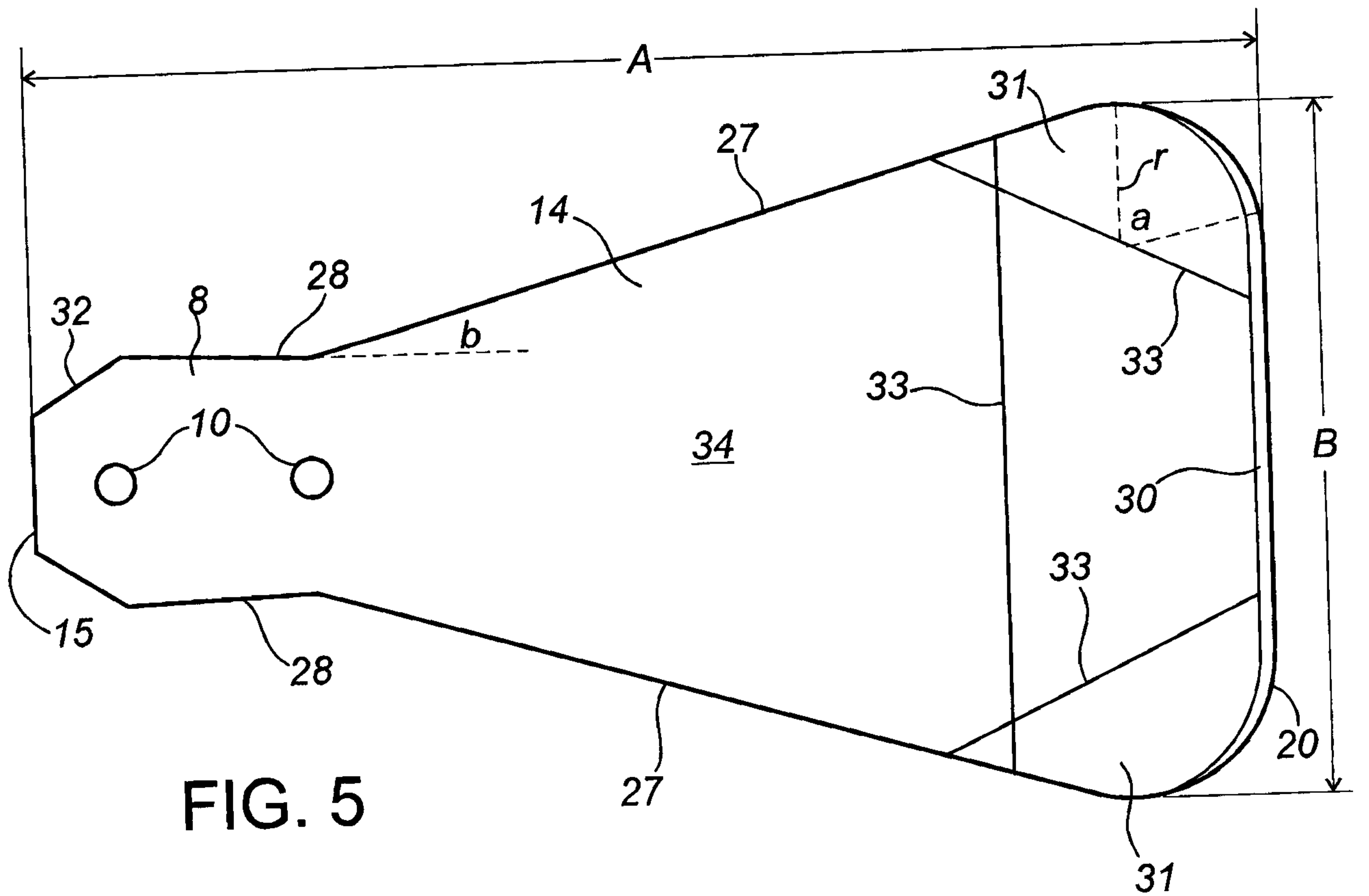
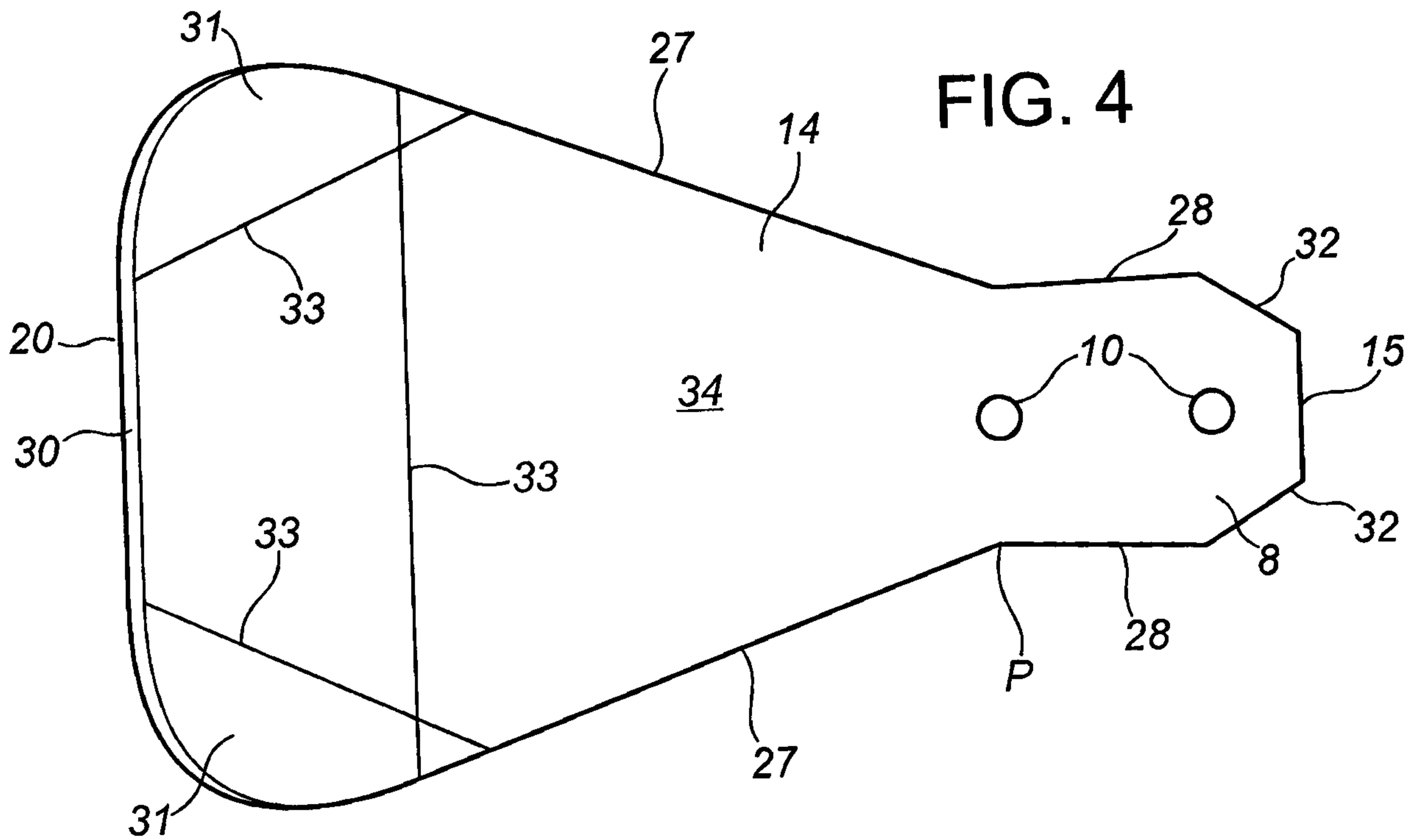
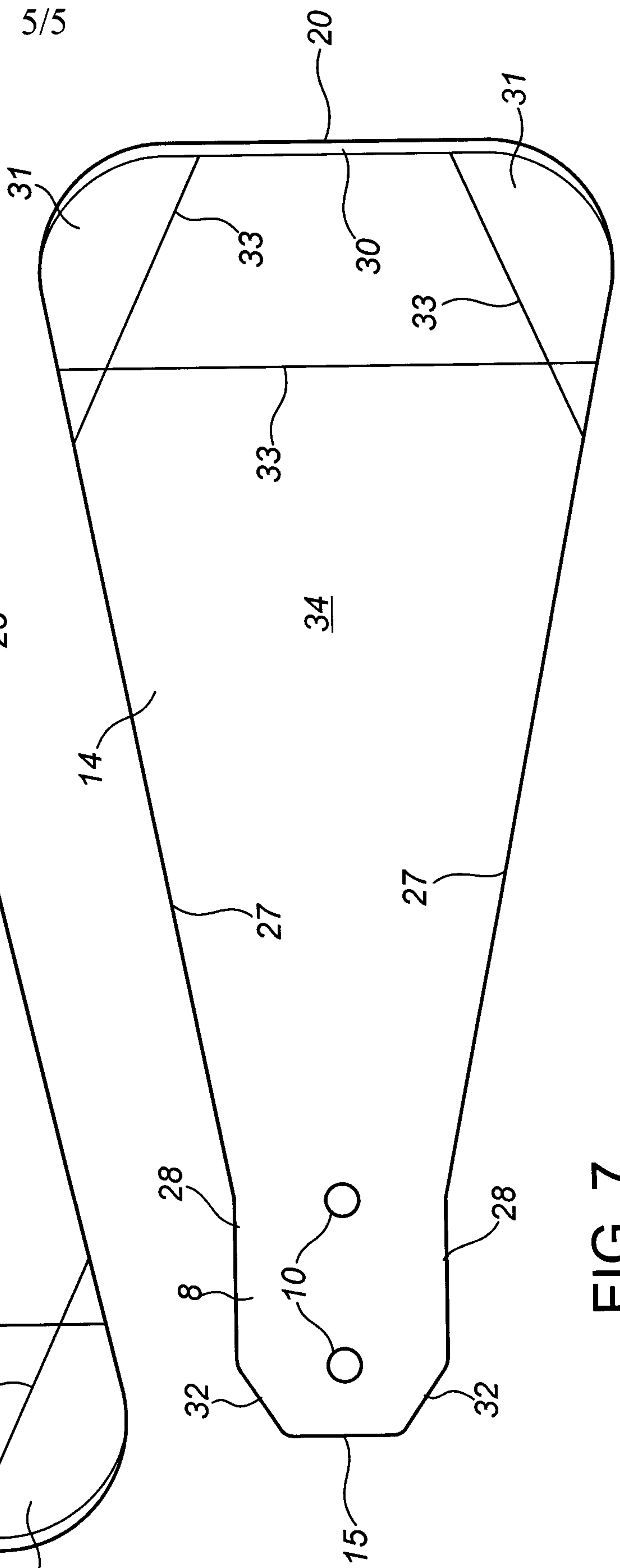
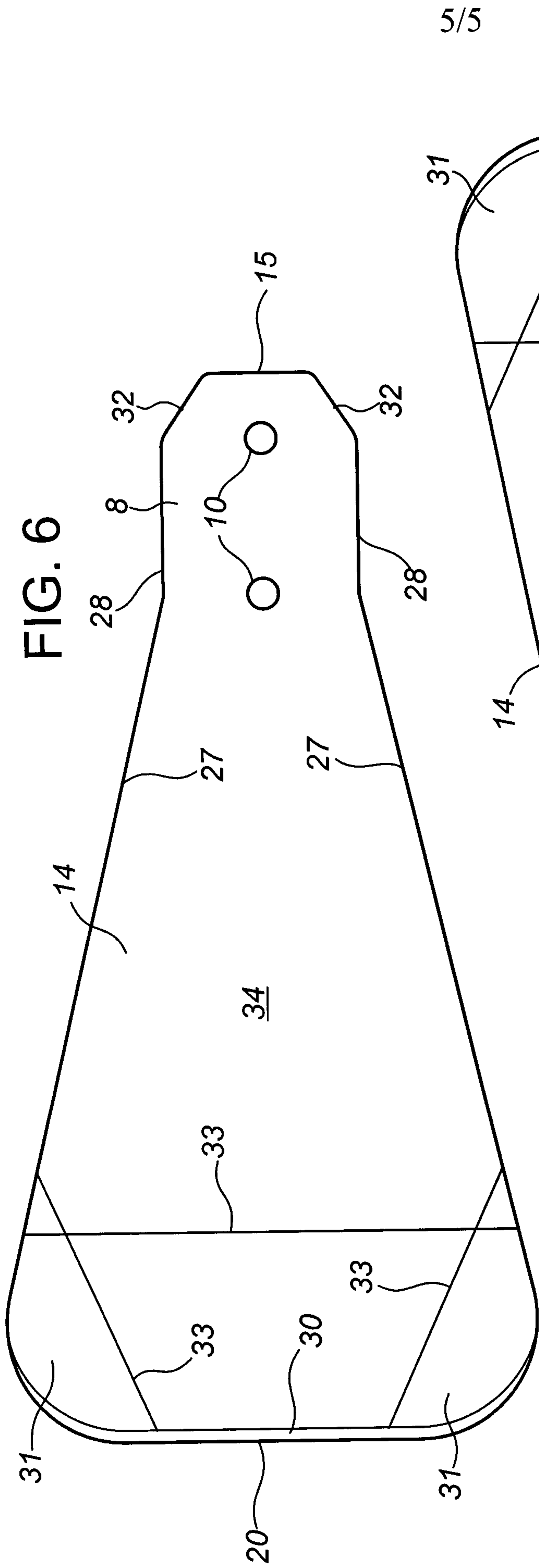


FIG. 2

4/5





5/5

