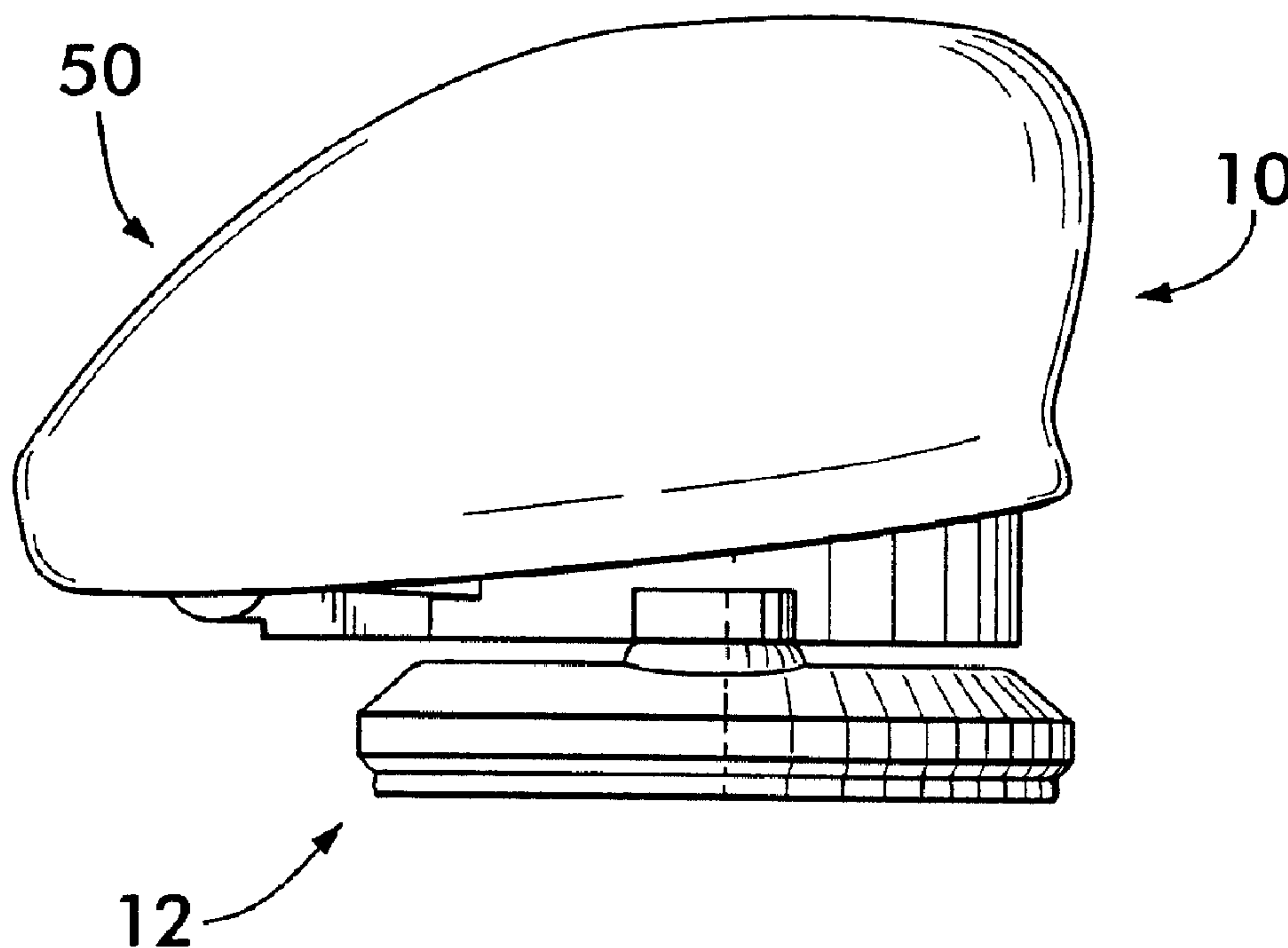




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(54) Titre : AGRAFEUSE A BASE AMOVIBLE  
 (54) Title: STAPLER HAVING DETACHED BASE



(57) Abrégé/Abstract:

A stapler having a detached base supporting an anvil and a first magnetic element, and a stapling assembly for ejecting staples from a magazine port. The stapling assembly supports a second magnetic element positioned for magnetic coupling to the base to align the anvil with the magazine port. Accordingly, the staple-driving stapling assembly and detached anvil-supporting base are not mechanically coupled. Instead, the stapling assembly and base are magnetically couplable. The magnetic coupling feature eliminates throat depth limitations and allows for staple placement at any desired location on a sheet of any size. An alignment guide may be provided to visually indicate an approximate location where a driven staple will be placed. The base and stapling assembly may be provided with friction pads for limiting movement of any sheets therebetween while stapling.

**ABSTRACT**

A stapler having a detached base supporting an anvil and a first magnetic element, and a stapling assembly for ejecting staples from a magazine port. The stapling assembly supports a second magnetic element positioned for magnetic coupling to the base to align the anvil with the magazine port. Accordingly, the staple-driving stapling assembly and detached anvil-supporting base are not mechanically coupled. Instead, the stapling assembly and base are magnetically couplable. The magnetic coupling feature eliminates throat depth limitations and allows for staple placement at any desired location on a sheet of any size. An alignment guide may be provided to visually indicate an approximate location where a driven staple will be placed. The base and stapling assembly may be provided with friction pads for limiting movement of any sheets therebetween while stapling.

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## **STAPLER HAVING DETACHED BASE**

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### **FIELD OF THE INVENTION**

The present invention relates generally to staplers for attaching a plurality of  
10 sheets of paper, or the like, to each other or to a surface, and particularly to a hand-  
operated stapler having a detached base.

### **BACKGROUND OF THE INVENTION**

Staplers using wire staples for attaching sheets of paper and other similar  
15 materials together are common in corporate, institutional, and educational  
environments. Manually operated and electrically powered staplers are well known

and in widespread use. Exemplary manual staplers are shown in U.S. Patent Nos. 2,973,519 to Jopp, 4,491,261 to Mitsuhashi, 4,496,091 to Yasuda, 4,506,819 to Rand and 4,927,067 to Leszczak, the disclosures of which are hereby incorporated herein by reference. These staplers are typical of those well known in the art in that they have an anvil-supporting base and a staple-driving stapling assembly mechanically coupled to the base by a fixed hinge. The stapling assembly is typical of those well known in the art in that they include a magazine pivotally mounted to the base for holding a bar of U-shaped staples interconnected in a readily separable manner, and an upper body including a staple ejector for driving successive staples out of the magazine, through sheets of paper, etc. and against the anvil on the base to crimp the legs of the staple and fasten the sheets.

These and other conventional staplers having a mechanically coupled base and stapling assembly share a disadvantage in that they define a throat between the base and stapling assembly that has a fixed depth. The throat depth limits the distance from the edge of a sheet at which a staple may be placed. In other words, because of the fixed hinge attaching the base and stapling assembly, the anvil and staple ejector can reach inwardly only a limited distance from an edge of a sheet, i.e. to the point at which the edge of the sheet reaches an inner portion of the throat near the fixed hinge.

This limitation is undesirable in some stapling situations, e.g. where there is a desire to perform "saddle stitching" staples in the center of the width of an 11 inch high by 17 inch wide sheet of paper to permit a fold producing a booklet measuring

approximately 8-1/2 inches wide by 11 inches high. Similarly, such conventional staplers are inadequate on large-scale projects, e.g. on posterboard or other relatively large scale projects such as student's art displays, on bulletin boards, on corporate or promotional displays, etc., where large-sized sheets are used. The use of large-sized sheets prohibits stapling at certain locations interior to the edges of the sheets using conventional staplers, and limits stapling to portions of the sheets near the edges.

What is needed is a stapler capable of stapling sheets at any desired location, including interior locations of relatively large-scale sheets.

#### SUMMARY OF THE INVENTION

The present invention provides a stapler having a staple-driving stapling assembly and a detached anvil-supporting base that are magnetically couplable. The magnetic coupling feature eliminates throat depth limitations caused by the fixed hinge of mechanically coupled staplers of the prior art, and allows for staple placement at any desired location on any size of sheet. Additionally, the stapling assembly may be used apart from the anvil-supporting base to drive staples into a bulletin board, etc. when crimping of the staples is not required.

In accordance with the present invention, a stapler with a detached base includes a base supporting an anvil and a first magnetic element, and a stapling assembly for ejecting staples from a magazine port. The stapling assembly

supports a second magnetic element positioned for magnetic coupling to the base to align the anvil with the magazine port.

Optionally, the base and/or the stapling assembly includes an alignment guide visually indicating an approximate location where a staple will be placed if driven by the stapling assembly.

In certain embodiments, the base and the stapling assembly are provided with friction pads positioned to cooperatively limit movement of any sheets therebetween while driving a staple from the stapling assembly and against the anvil of the base.

In a particular alternative embodiment, the base is provided with an annular magnet, the anvil being positioned interior to the annular magnet, and the anvil defining a plurality of radially extending crimping surfaces such that the base and stapling assembly may be magnetically coupled and operated to clinch staples in various relative rotational positions.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side view of a stapler in accordance with an exemplary embodiment of the present invention, showing the stapling assembly magnetically coupled to the base;

Figure 2 is a bottom view of the stapler of Figure 1;

Figure 3 is sectional view of the stapler of Figure 1, taken along line 3-3 of Figure 2;

Figure 4 is a sectional view of the stapler of Figure 1, taken along line 4-4 of Figure 3;

Figure 5 is a plan view of the stapling assembly of Figure 1, showing the stapling assembly in an open position;

5 Figure 6 is a bottom view of the stapling assembly of Figure 1;

Figure 7 is a top view of the base of Figure 1;

Figure 8 is a perspective view of an exemplary base in accordance with an alternative embodiment of the present invention;

10 Figure 9 is a perspective view of an exemplary base in accordance with another alternative embodiment of the present invention;

Figure 10 is a perspective view of an exemplary base in accordance with yet another alternative embodiment of the present invention; and

Figure 11 is a perspective view of an exemplary base in accordance with still another alternative embodiment of the present invention.

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#### DETAILED DESCRIPTION

Figures 1-7 show a stapler with detached base in accordance with the present invention. As shown in Figures 1 and 3, the stapler 10 includes a base 12 and a stapling assembly 50.

20 As best shown in Figure 7, the base 12 supports an anvil 14 defining crimping surfaces 14a, 14b for crimping staples driven by the stapling assembly 50, as is well known in the art. In accordance with the present invention, the base 12 also

supports a first magnetic element. As used herein, the term "magnetic element" includes a member capable of attracting another body by magnetism, as well as a member capable of being attracted to another body by magnetism. For example, a magnetic element may include a natural lodestone or a mass of iron, steel, or alloy that has been artificially magnetized, such as a neodymium magnet. Additionally, a magnetic element may include a mass of iron that is attractable by magnetism.

In the embodiment shown in Figures 1-7, the first magnetic element 16 includes first and second permanent magnets 16a, 16b, such as neodymium magnets, supported on the base 12 in a spaced relationship, as best shown in Figures 4 and 7. The use of multiple discrete magnets spaced from one another assists in ensuring proper alignment with the stapling assembly, as discussed in greater detail below. As shown in Figures 6 and 7, the magnets 16a, 16b are positioned on the base 12 along a line extending transversely to a longitudinal axis of a magazine 52 of the stapling assembly 50 when the stapling assembly 50 is coupled to the base 12, as will be discussed further below. Alternatively (not shown), the magnets 16a, 16b are positioned on the base along a line extending substantially parallel to the longitudinal axis of the magazine.

In a preferred embodiment, the magnets 16a, 16 are positioned so that each exposes an opposite magnetic pole for coupling to the stapling assembly. For example, as shown in Figure 7, magnet 16a is positioned on the base to expose its north pole

while magnet 16b is positioned on the base 12 to expose its south pole. In this manner, coupling of the base and the stapling assembly in a predetermined relationship is ensured, as discussed in greater detail below.

5 The stapling assembly 50 is configured for ejecting staples from a magazine port, as is well known in the art. Accordingly, the stapling assembly 50 may be of a type generally known in the art. For example, as shown in Figures 3-6, the stapling assembly 50 includes a magazine 52 for receiving a bar of staples 54 interconnected in a readily separable manner, and a selectively actuatable ejector 56 for driving successive staples out of the magazine 52 through a magazine port 10 58. In addition, the stapling assembly 50 may include a handle 60 pivotally mounted to the magazine 52 by pins 62, such that pivotal motion of the handle 60 relative to the magazine 52 actuates the ejector 56 to eject a staple, at which point the handle, magazine and ejector are spring biased to return to their original position. The handle 60 may include a lower handle body 60a supporting the magazine 52 and an 15 upper handle body 60b pivotally connected to the lower handle body 60a. The upper handle body 60b supports the ejector 56. This and other suitable arrangements are well known in the art and any suitable arrangement may be used that provides the above-described functionality. Accordingly, the stapling assembly 50 of the present invention functions to receive, store and drive staples like a 20 conventional stapling assembly.

However, in accordance with the present invention, the stapling assembly 50 includes a magnetic element magnetically couplable with the magnetic element 16

on the base 12, as best shown in Figures 4 and 6. For example, the magnetic element 64 on the stapling assembly 50 may comprise a magnet, or a member capable of being attracted to a magnet by magnetism. In embodiments in which magnets are disposed on both the stapling assembly 50 and the base 12, each magnet on the stapling assembly 50 is arranged to expose an opposite pole of a corresponding magnet on the base 12. The magnetic element on the stapling assembly 50 is positioned on the stapling assembly 50 for magnetically coupling the base 12 to the stapling assembly 50 to align the anvil 14 with the magazine port 58.

In the embodiment shown in Figures 1-7, the magnetic element 64 of the stapling assembly 50 includes third and fourth permanent magnets 64a, 64b, such as neodymium magnets, supported on the stapling assembly 50 in a spaced relationship corresponding to the spaced relationship of the first and second magnets 16a, 16b on the base 12. As shown in Figure 6, the magnets 16a, 16b and 64a, 64b are positioned along a line extending transversely to a longitudinal axis of the magazine 52.

In a preferred embodiment, as best shown in Figure 4, the base 12 further includes spring members 22a, 22b biasing the first magnets 16a, 16b, respectively, from a first position in which a contact surface 18 of the first magnets 16a, 16b is substantially aligned with a plane 20 of the anvil 14 (not shown), to a second position in which the contact surface 18 is spaced from the plane, as shown in Figure 4. The spring members 22a, 22b comprise, for example, a pair a coil springs as shown. However, it is understood that any biasing means that will urge the

magnets 16a, 16b upward, e.g. a "living spring," leaf spring, resilient material, etc. may be used as spring members 22a, 22b. In this manner, the magnets 16a, 16b are resiliently displaceable from the plane 20 of the anvil 14, to provide clearance for a crimped staple ejected from the stapling assembly 50, as discussed in detail  
5 below.

Preferably, as best shown in Figures 3, 4, 6 and 7, the base 12 includes a first friction pad 28 and the stapling assembly 50 includes a second friction pad 66. The pads are constructed of a material having a relatively high coefficient of friction, such as rubber or Kraton™. The first and second friction pads 28, 66 are positioned  
10 to cooperatively hold sheets positioned therebetween to limit movement of the sheets relative to the base 12 and/or stapling assembly 50 while driving a staple from the stapling assembly 50 and against the anvil 14 of the base 12. Each friction pad may include one or more discrete pads.

In accordance with the present invention, the base may have various  
15 alternative configurations, as discussed below with reference to Figures 8-11. In the alternative embodiments shown in Figures 8 and 9, the base 12 is configured with a cantilevered beam for supporting the magnetic element in a similar resiliently displaceable manner. This eliminates the need for spring members 22a, 22b of Figures 1-7. For example, Figure 8 shows cantilevered beam(s) 24a, 24b, each of  
20 which is integrally formed with the base 12, e.g. by an injection molding or machining process, for supporting magnets 16a, 16b. The cantilevered beams 24a,

24b are separated from a portion of the base 12 by slits 25 to allow the cantilevered beams 24a, 24b to flex relative to the base 12.

In the embodiment shown in Figure 8, the contact surface 18 of the magnets 16a, 16b are resiliently displaceable to a position in which the magnets' contact surface 18 is substantially aligned with the plane 20 of the anvil 14, similarly to the  
5 embodiment discussed above with reference to Figures 1-7. This is particularly advantageous when the magnetic element is positioned relatively close to the anvil, as shown in Figures 1 and 8. Accordingly, positive abutting contact between the magnetic elements on the base and the stapling assembly can be maintained  
10 throughout the stapling process, while the cantilevered beam resiliently deflects in a pivoting motion.

In the alternative embodiment shown in Figure 9, the cantilevered beam 24 is provided in the form of a mesa 26 separated from a portion of the base 12 by slits 25. The mesa 26 supports the contact surface 18 of the magnets 16a, 16b in a  
15 position spaced above the plane 20 of the anvil 14. Such a cantilevered beam 24 is particularly advantageous when the magnetic element is positioned relatively far from the anvil, as shown in Figure 9. Accordingly, positive abutting contact between the magnetic elements on the base and the stapling assembly can be maintained  
20 throughout the stapling process, while the cantilevered beam 24, which is integral with the base, resiliently deflects in a pivoting motion to allow the stapling assembly's magazine 52 to move toward the anvil 14.

In the alternative embodiment shown in Figure 10, the base 12 defines a fixed mesa 26. The mesa 26 supports the contact surface 18 of the magnets 16a, 16b in a position spaced above the plane 20 of the anvil 14. There is no cantilevered beam supporting the magnets 16a, 16b on the base 12. In this embodiment, in which the magnetic element is positioned relatively far from the anvil, positive contact between the magnetic elements on the base and the stapling assembly is not maintained throughout the stapling process. Rather, the magnetic elements allow a small separation during stapling to allow the magazine 52 to pivot at the mesa 26 toward the anvil 14.

In another alternative embodiment shown in Figure 11, the magnetic element 16 mounted on the base 12 (or the stapling assembly 50) comprises an annular magnet, and the anvil 14 is positioned interior to the annular magnet 16 on the base 12. The anvil 14 is configured to define a plurality of radially extending crimping surfaces 14a, 14b, 14c, 14d, 14e, 14f, etc. In this manner, the base 12 and stapling assembly 50 may be magnetically coupled at various relative rotational positions and yet a staple driven from the stapling assembly 50 can be crimped by corresponding crimping surfaces of the anvil 14.

In certain embodiments, the stapler includes an alignment guide visually indicating a location where a staple will be placed if driven by the stapling assembly 50. The alignment guide may have any suitable form. Longitudinal and lateral alignment guides may be provided. For example, a stripe 30 may be painted on or molded into the base 12 or stapling assembly 50, as shown in Figures 8 and 10.

The stripe may be aligned with the crimping surfaces 14a, 14b of the anvil 14. Alternatively, the alignment guide may include ears, tabs, etc. 32, as shown in Figure 9. In another embodiment, at least a portion of the base and/or stapling assembly is constructed of a transparent material to see the anvil, magazine, or alignment guides (not shown). Preferably, the alignment guide is plainly visible when looking downward on the top of the stapling assembly 50.

A stapler 10 according to the present invention may be prepared for use by positioning sheets to be stapled, of any size, over the base 12. The stapling assembly 50, having a bar of staples loaded in its magazine, may then be positioned over the sheets in the approximate location of the base. The magnetic elements of the base 12 and stapling assembly 50 will then cause the base and stapling assembly to magnetically couple with the anvil 14 of the base 12 in alignment with the magazine port 58 of the stapling assembly 50. If desired, the stapler 10 may be repositioned relative to the sheets by sliding the stapling assembly relative to the sheets. The base 12 moves correspondingly to preserve the proper alignment due to the magnetic coupling of the base and stapling assembly. When the stapler 10 is positioned in the desired location, the ejector 56 of the stapling assembly 50 is actuated, e.g. by forcibly urging an upper handle member of the stapling assembly toward the base 12. This causes the ejector to drive a staple from the bar of staples in the magazine 52. The staple exits through the magazine port 58 and passes through the sheets and into the anvil, at which time the legs of the staple are crimped by the crimping surfaces of the anvil to fasten the sheets. During this

stapling process, the friction pads, if any, are urged toward the sheets and toward one another to grip and hold the sheets during the stapling process. Additionally, the magnetic elements on the base and/or stapling assembly, if applicable, are resiliently deflected. However, as the stapling assembly 50 returns to a rest position, e.g. by spring biasing as known in the art, the cantilevered beams, and/or spring elements return to their rest positions, causing the sheets to at least partially disengage from the friction pads and to separate the base and anvil and the stapling assembly to provide clearance for the crimped staple fastening the sheets and facilitate movement or removal of the stapler 10 relative to the sheets without tearing the sheets.

Having thus described particular embodiments of the invention, various alterations, modifications, and improvements will readily occur to those skilled in the art. Such alterations, modifications and improvements as are made obvious by this disclosure are intended to be part of this description though not expressly stated herein, and are intended to be within the spirit and scope of the invention.

Accordingly, the foregoing description is by way of example only, and not limiting. The invention is limited only as defined in the following claims and equivalents thereto.

What is claimed is:

1. A stapler with a detached base comprising:

a base supporting an anvil and a first magnetic element; and

5 a stapling assembly for ejecting staples from a magazine port, said stapling assembly supporting a second magnetic element, said second magnetic element being positioned on said stapling assembly for magnetically coupling said base to said stapling assembly to align said anvil with said magazine port.

10 2. The stapler of claim 1, said stapling assembly comprising:

a magazine for receiving a bar of staples interconnected in a readily separable manner; and

a selectively actuatable ejector for driving successive staples out of said magazine through said magazine port.

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3. The stapler of claim 2, said stapling assembly further comprising:

a handle movably mounted to said magazine, motion of said handle relative to said magazine actuating said ejector.

20

4. The stapler of claim 1, said base further comprising a spring member biasing said first magnetic element from a first position in which a contact surface of

said first magnetic element is substantially aligned with a plane of said anvil, and a second position in which said contact surface is spaced from said plane.

5           5.       The stapler of claim 1, wherein said first magnetic element comprises  
5 first and second magnets supported on said base in a spaced relationship, and  
wherein said second magnetic element comprises third and fourth magnets  
supported on said stapling assembly in a corresponding spaced relationship.

10           6.       The stapler of claim 5, wherein said first and second magnets are  
10 positioned to expose opposite magnetic poles for coupling to said stapling assembly.

15           7.       The stapler of claim 1, wherein said first magnetic element comprises  
an annular magnet, and wherein said anvil is positioned interior to said annular  
magnet, said anvil defining a plurality of radially extending crimping surfaces.

15           8.       The stapler of claim 1, wherein said base comprises a cantilevered  
beam and said first magnetic element is supported on said cantilevered beam.

20           9.       The stapler of claim 1, wherein said first magnetic element comprises a  
20 first permanent magnet and said second magnetic element comprises a second  
permanent magnet.

10. The stapler of claim 9, wherein each of said first magnetic element and said second magnetic element comprises a plurality of permanent magnets.

5 11. The stapler of claim 10, wherein at least two of said plurality of permanent magnets are positioned along a line extending transversely to a longitudinal axis of a magazine of said stapling assembly.

10 12. The stapler of claim 10, wherein at least two of said plurality of permanent magnets are positioned along a line extending substantially parallel to a longitudinal axis of a magazine of said stapling assembly.

15 13. The stapler of claim 1, said base further comprising an alignment guide visually indicating an approximate location where a staple will be placed if driven by said stapling assembly.

14. The stapler of claim 1, said stapling assembly further comprising an alignment guide visually indicating an approximate location where a staple will be placed if driven by said stapling assembly.

20 15. The stapler of claim 1, wherein said base comprises a first friction pad and said stapling assembly comprises a second friction pad, said first and second friction pads being positioned on said base and said stapling assembly to

cooperatively limit movement of any sheets therebetween while driving a staple from said stapling assembly and against said anvil of said base.

16. A stapler comprising:

- 5 a base supporting an anvil and a first magnetic element, said first magnetic element being resiliently biased for displacement from a first position in which a contact surface of said first magnetic element is substantially aligned with a plane of said anvil, and a second position in which said contact surface is spaced from said plane;
- 10 a lower handle body supporting a magazine for receiving a bar of staples interconnected in a readily separable manner, said lower handle body supporting a second magnetic element cooperable with said first magnetic element to align said anvil with a port of said magazine and magnetically couple said base to said lower handle body;
- 15 an upper handle body movably connected to said lower handle body, said upper handle body supporting an ejector for driving successive staples of the bar of staples out of said magazine;
- a first friction pad supported on said base; and
- a second friction pad supported on said lower handle body in position to
- 20 cooperate with said first friction pad to limit movement of any sheets therebetween while driving a staple from said magazine and against said anvil of said base.

17. The stapler of claim 16, said lower handle body further comprising an alignment guide visually indicating an approximate location where a staple will be placed if driven from said magazine.

5 18. The stapler of claim 16, wherein said first magnetic element comprises at least two permanent magnets positioned along a line extending transversely to a longitudinal axis of said magazine.

10 19. The stapler of claim 16, wherein said first magnetic element comprises at least two permanent magnets positioned along a line extending substantially parallel to a longitudinal axis of said magazine.

20. A stapler comprising:  
a base supporting an anvil, said base comprising a first magnetic element  
15 defining a contact surface spaced above a plane of said anvil; and  
a stapling assembly having an ejector for driving successive staples out of said stapling assembly and against said anvil, said stapling assembly comprising a second magnetic element positioned to align an ejected staple with said anvil when said base and stapling assembly are magnetically coupled.

20 21. The stapler of claim 20, wherein said first magnetic element is supported on a cantilevered beam of said base.

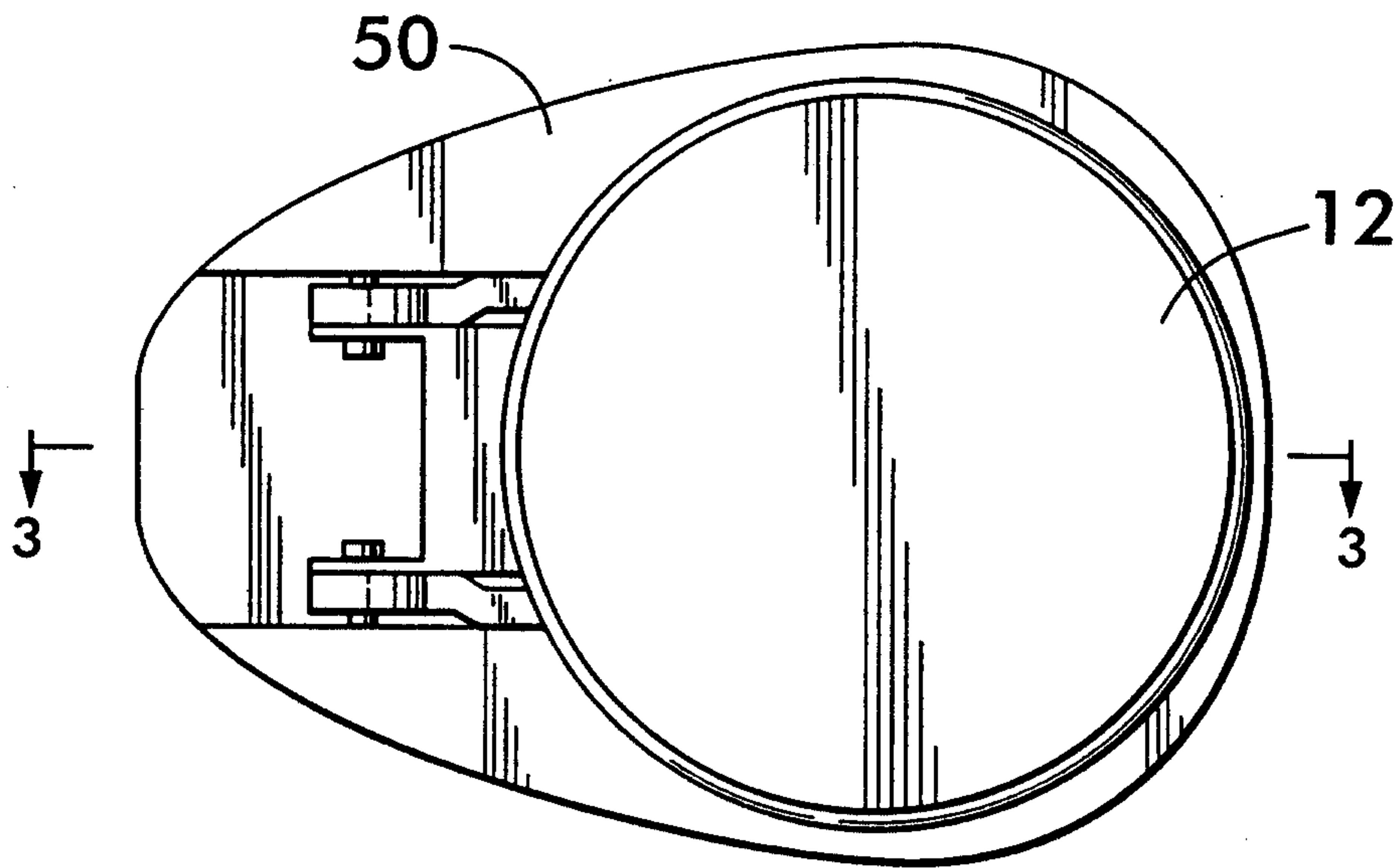
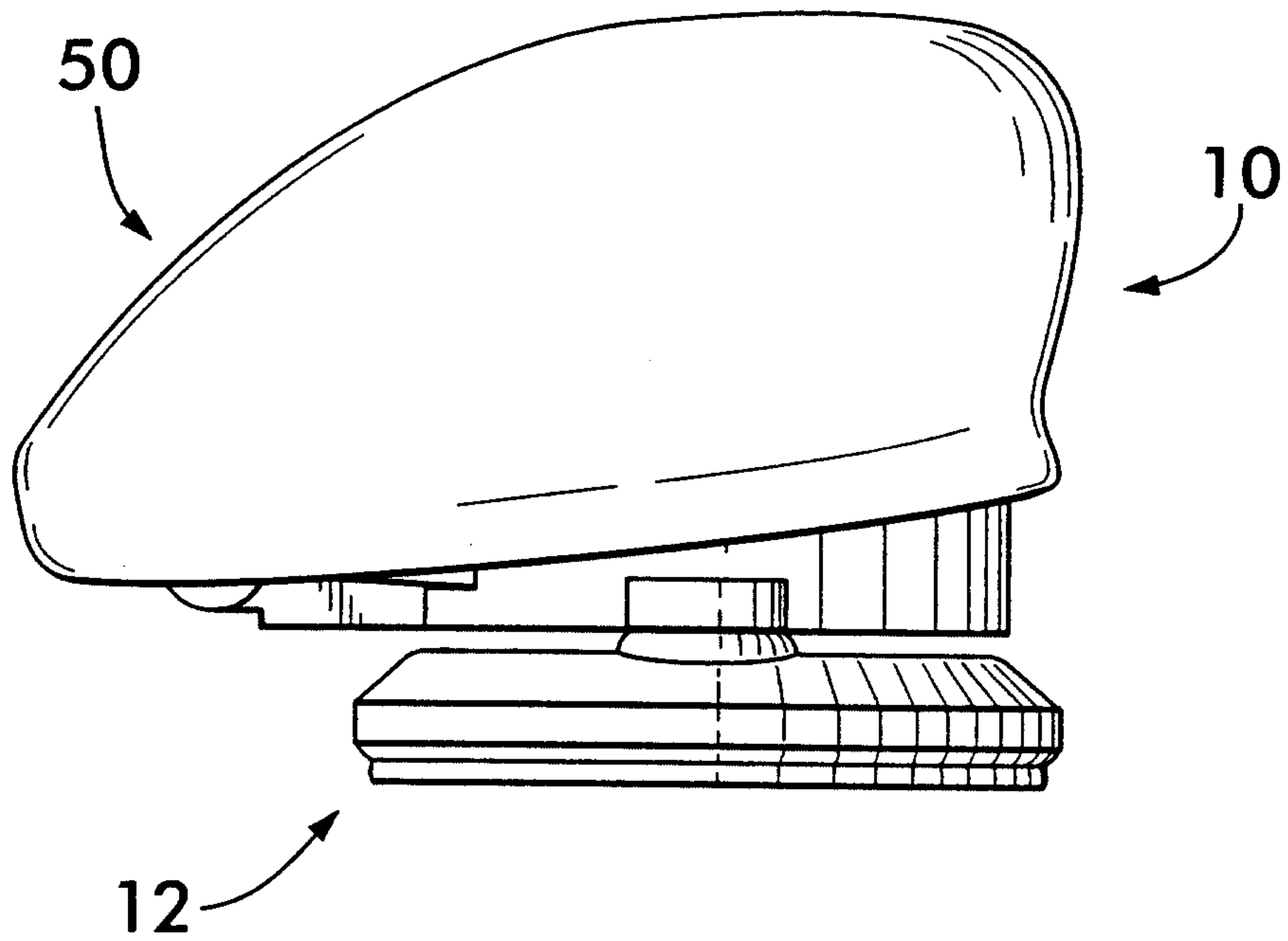
22. A method for fastening a plurality of sheets with a staple, the method comprising the steps of:

positioning a stapler's detached base adjacent a first side of the plurality of sheets, the base supporting an anvil;

5 positioning the stapler's stapling assembly adjacent an opposite side of the plurality of sheets to magnetically couple the detached base to the stapling assembly with the base's anvil aligned with a magazine port of the stapling assembly; and

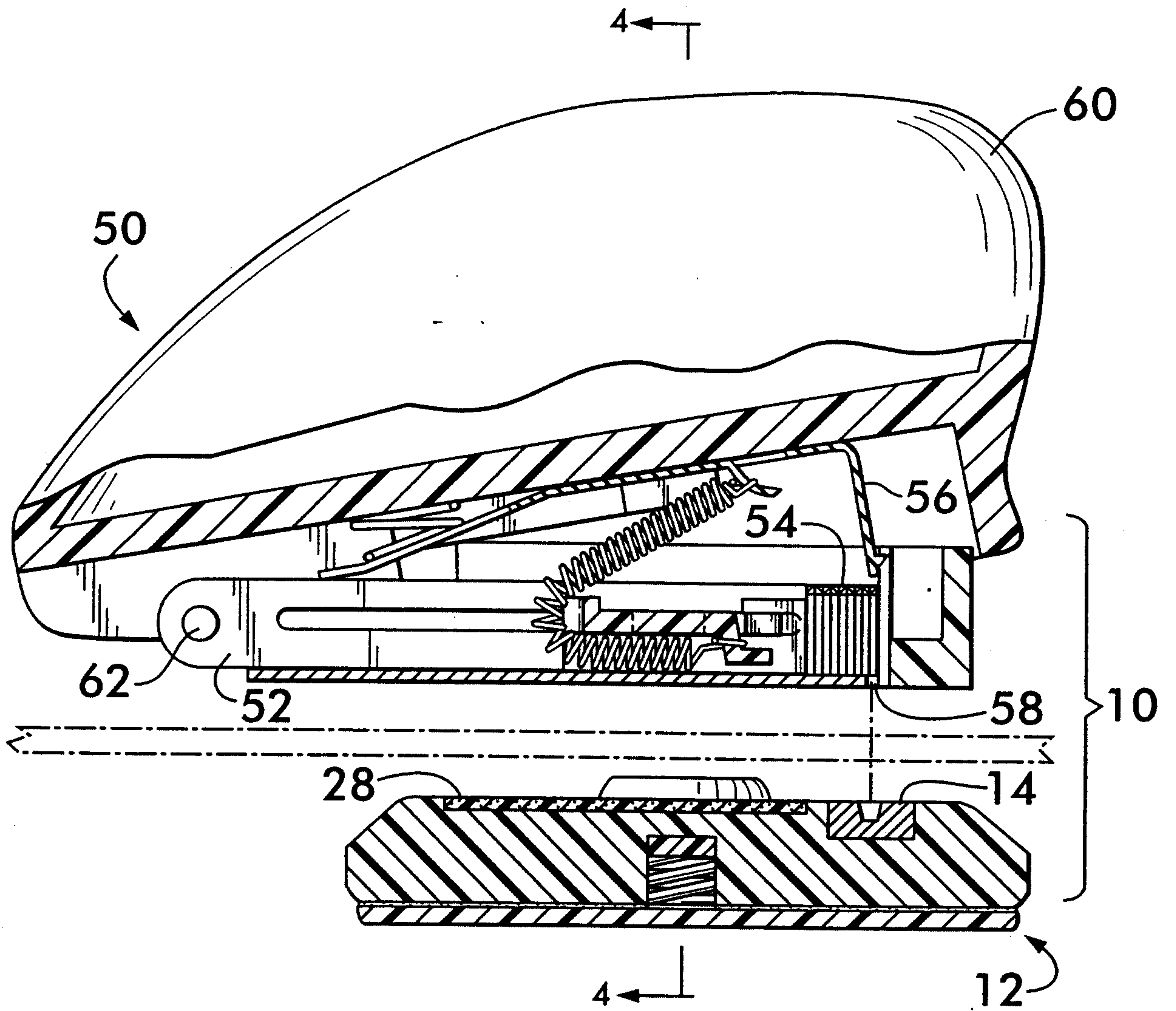
10 driving a staple from the stapling assembly, through the plurality of sheets and against the base to clinch the staple and fasten the plurality of sheets.

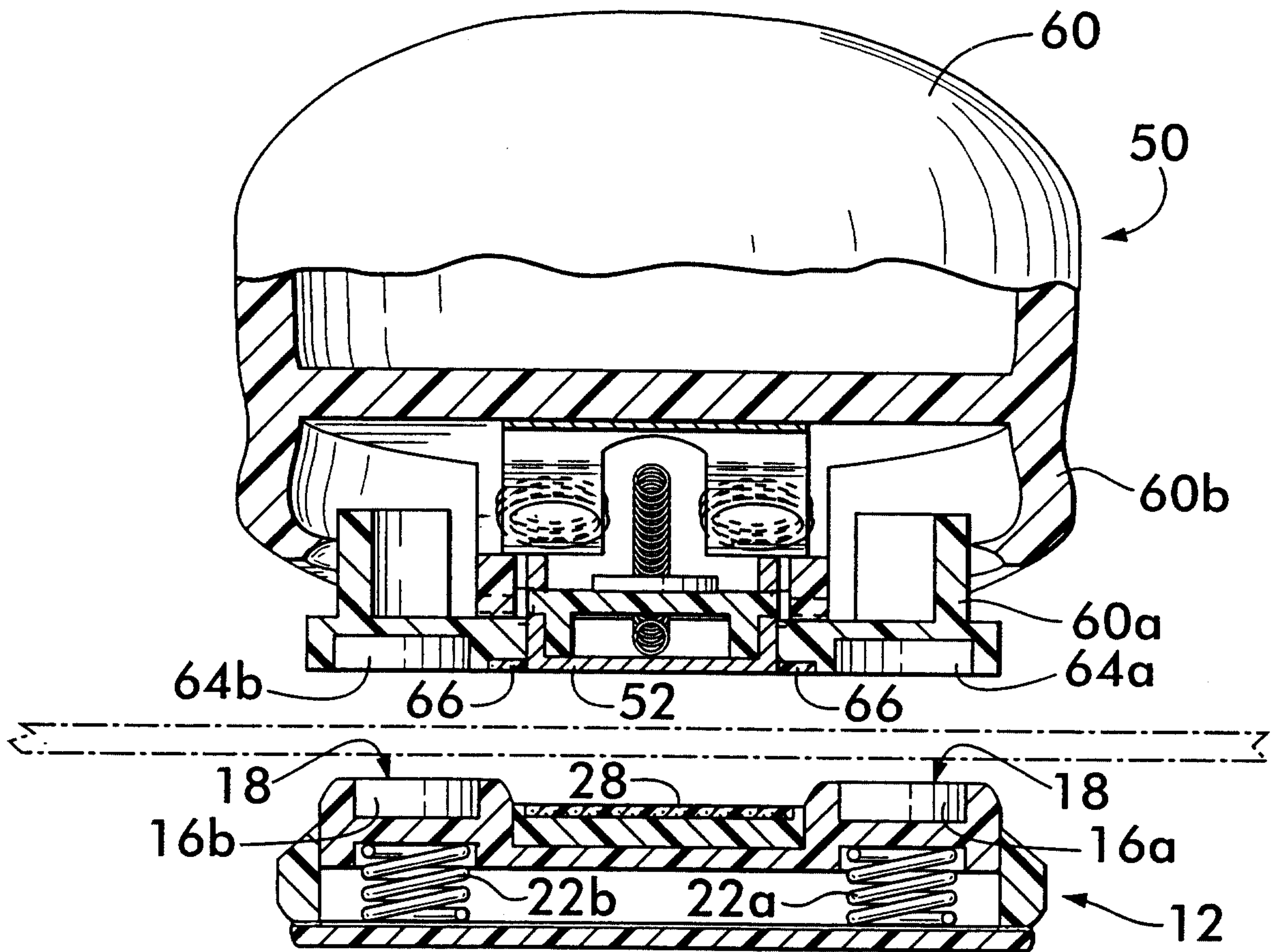
**FIG. 1**



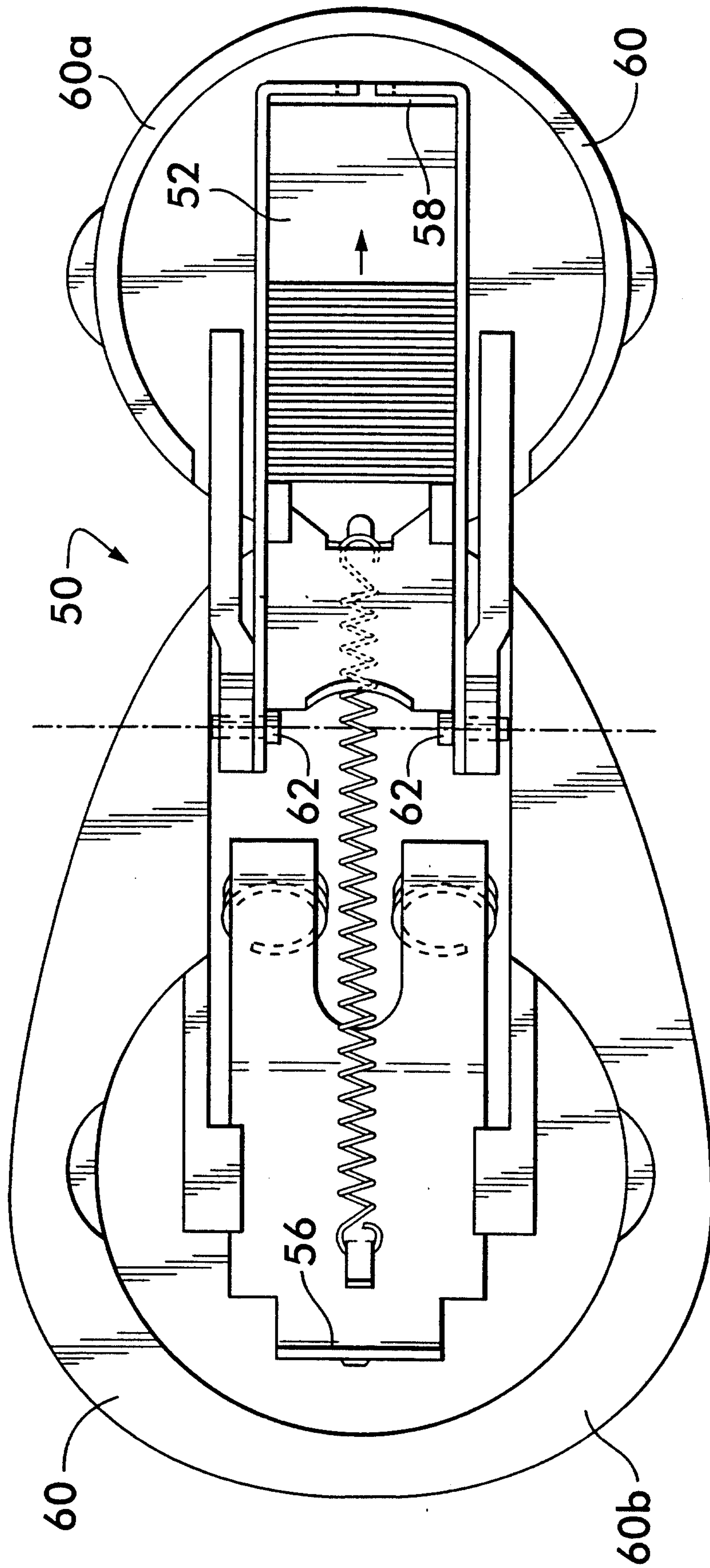
**FIG. 2**

**FIG. 3**



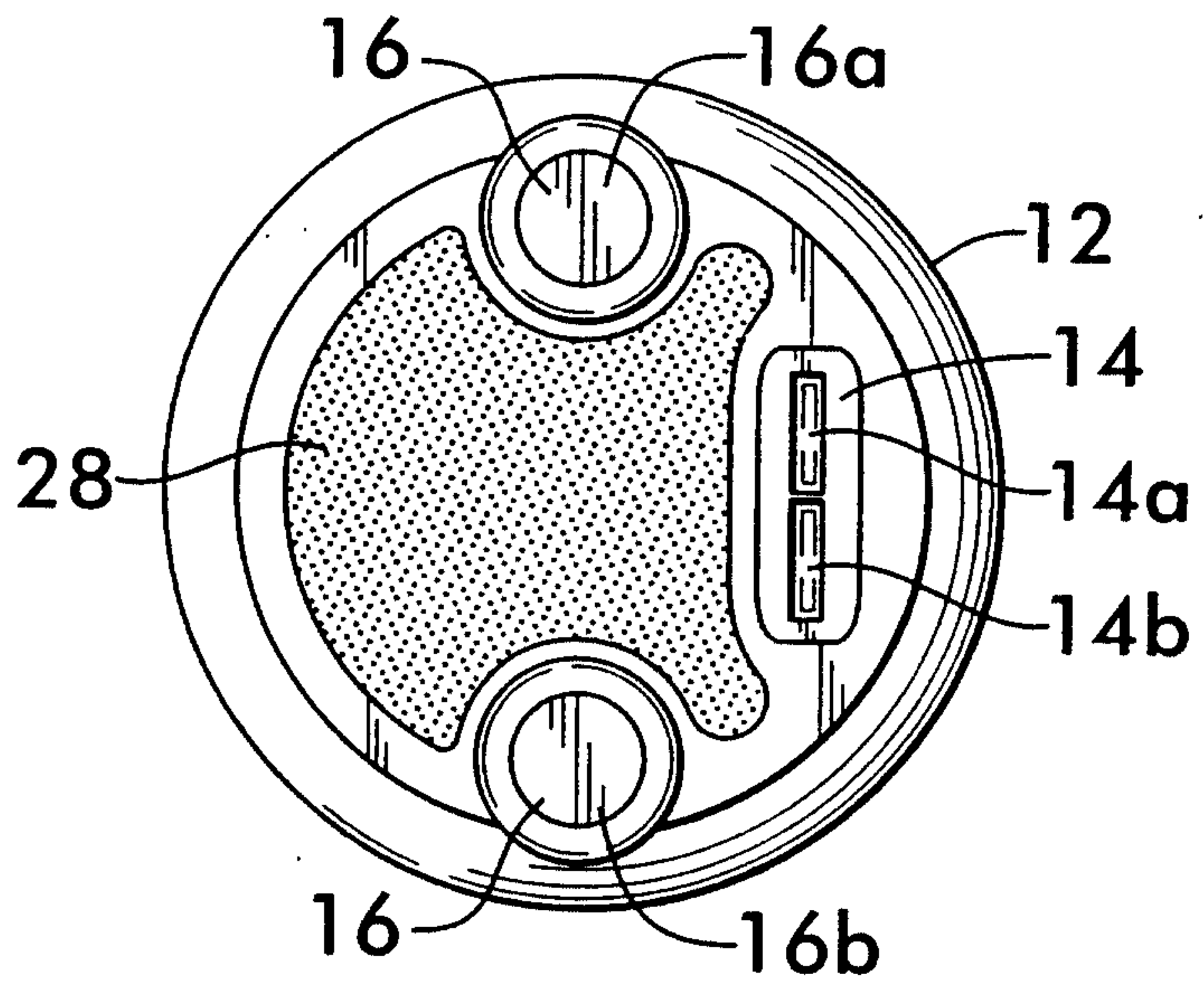
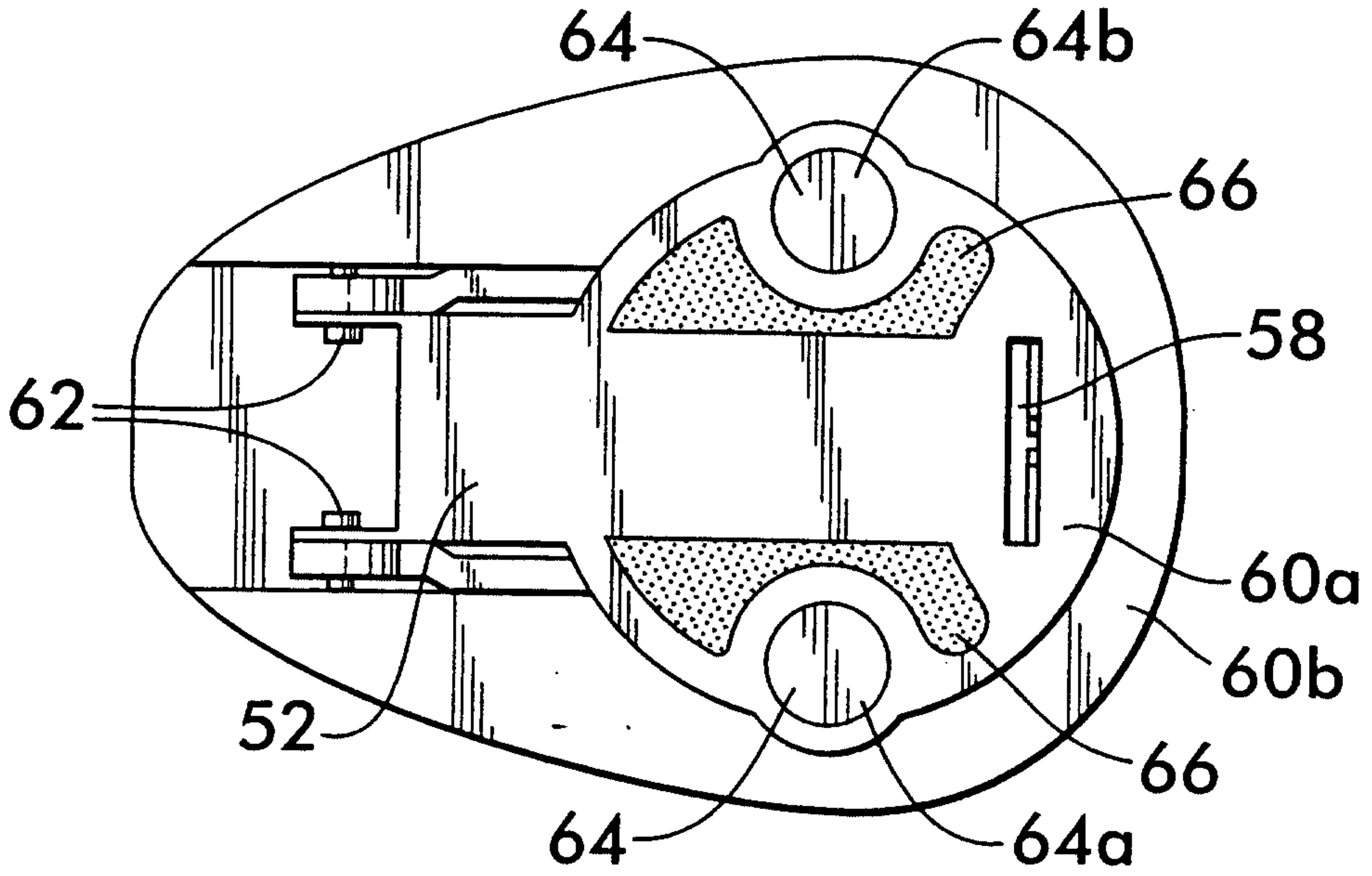


**FIG. 4**

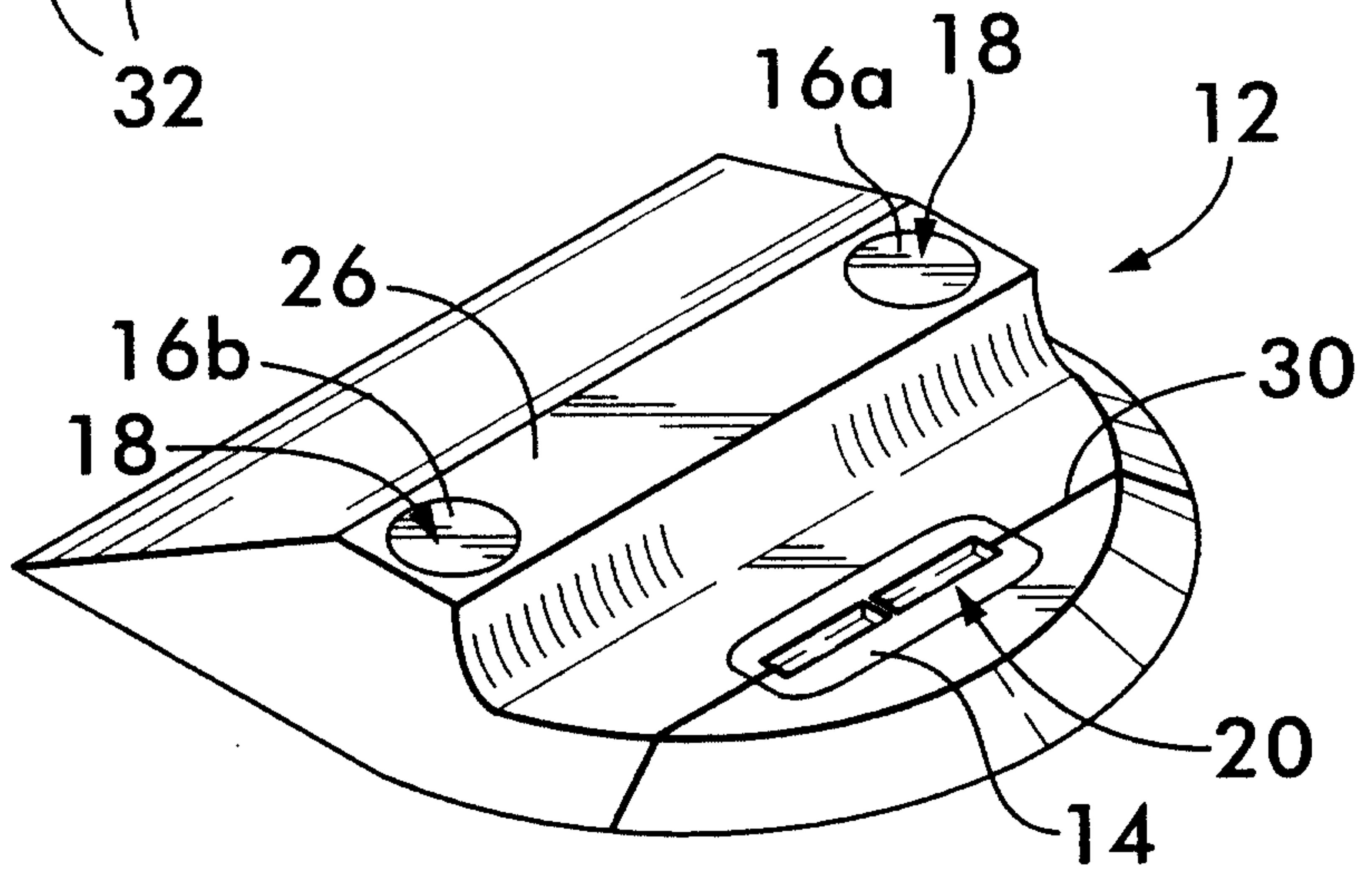
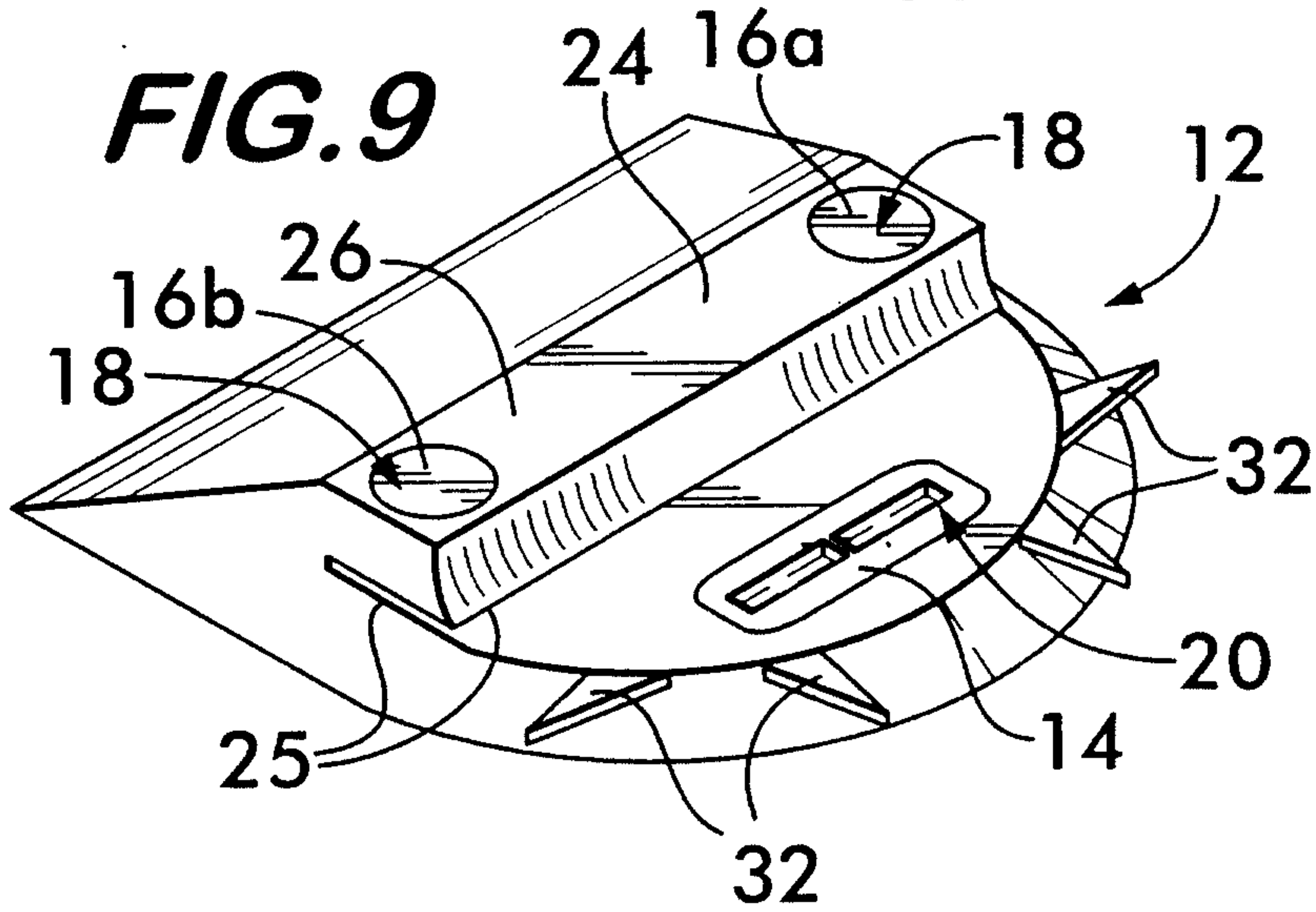
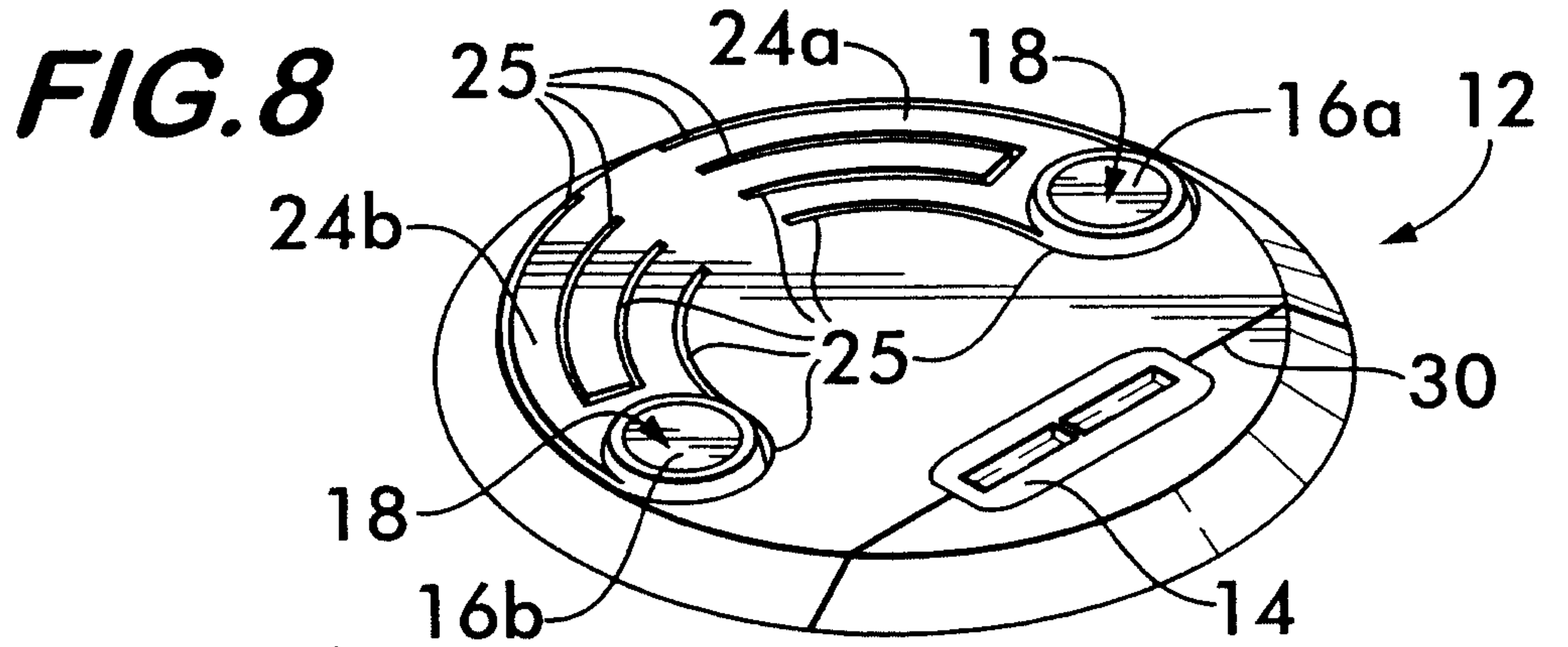


**FIG. 5**

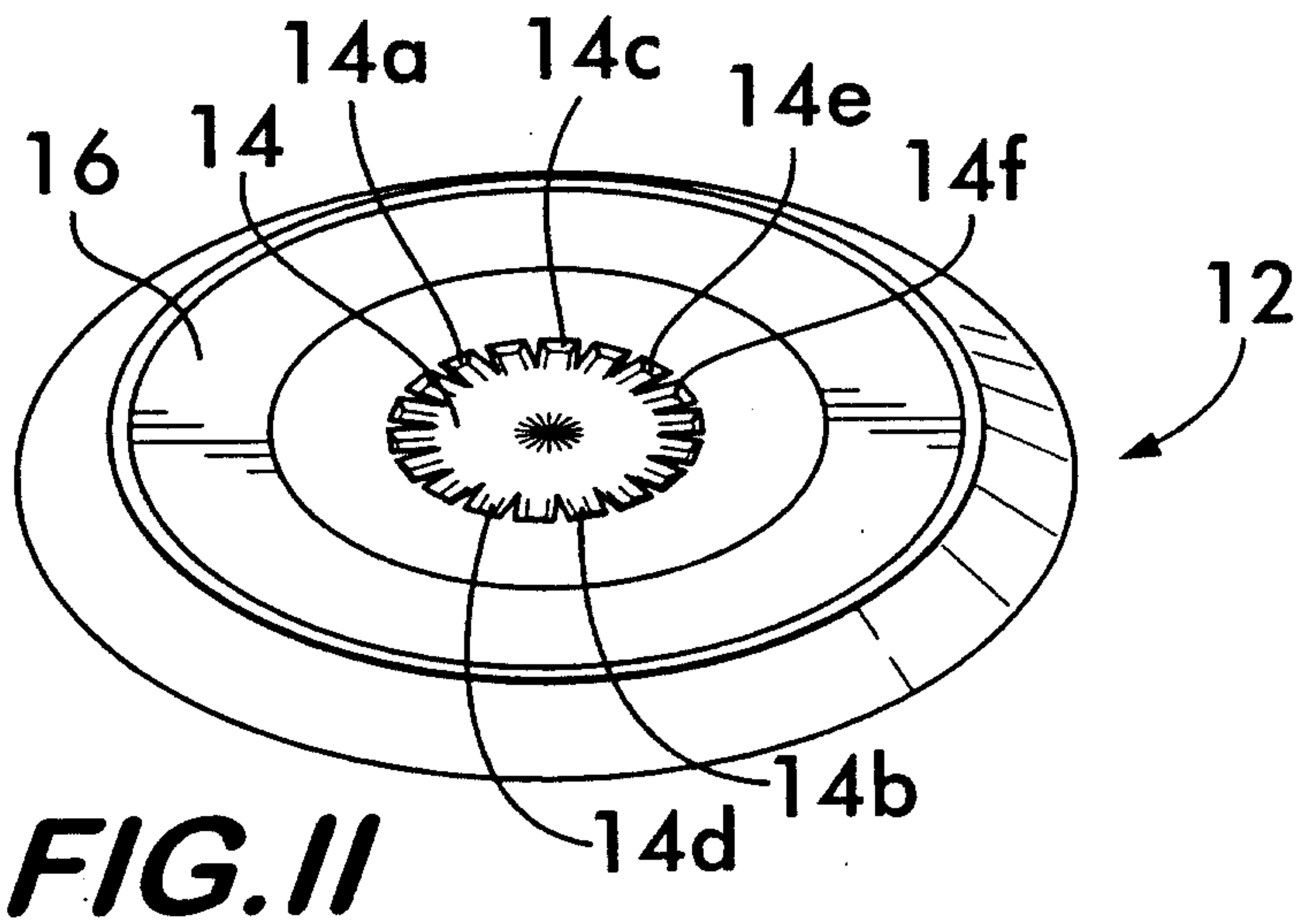
**FIG. 6**

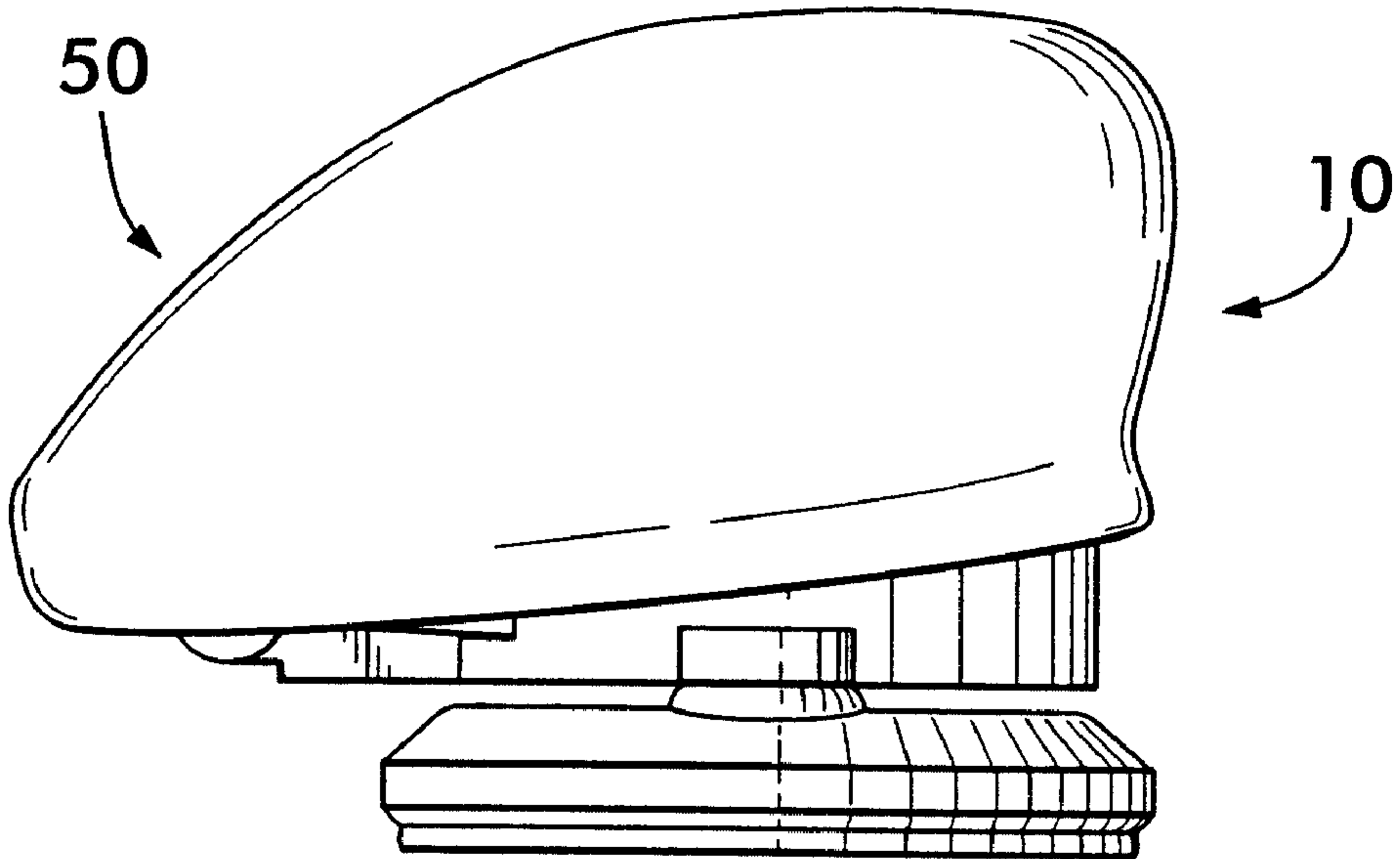


**FIG. 7**



**FIG. 10**





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