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Oetjen

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(54) **MAGNETIC LIGHT SYSTEM FOR
ILLUMINATING THE MARGINS OF A
WINDSHIELD**

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F21V 21/096 (2006.01)

(52) **U.S. Cl.**
CPC **F21V 21/096** (2013.01)

(58) **Field of Classification Search**
CPC ... F21V 21/096; F21V 21/0965; B60Q 1/268;
B60Q 3/208
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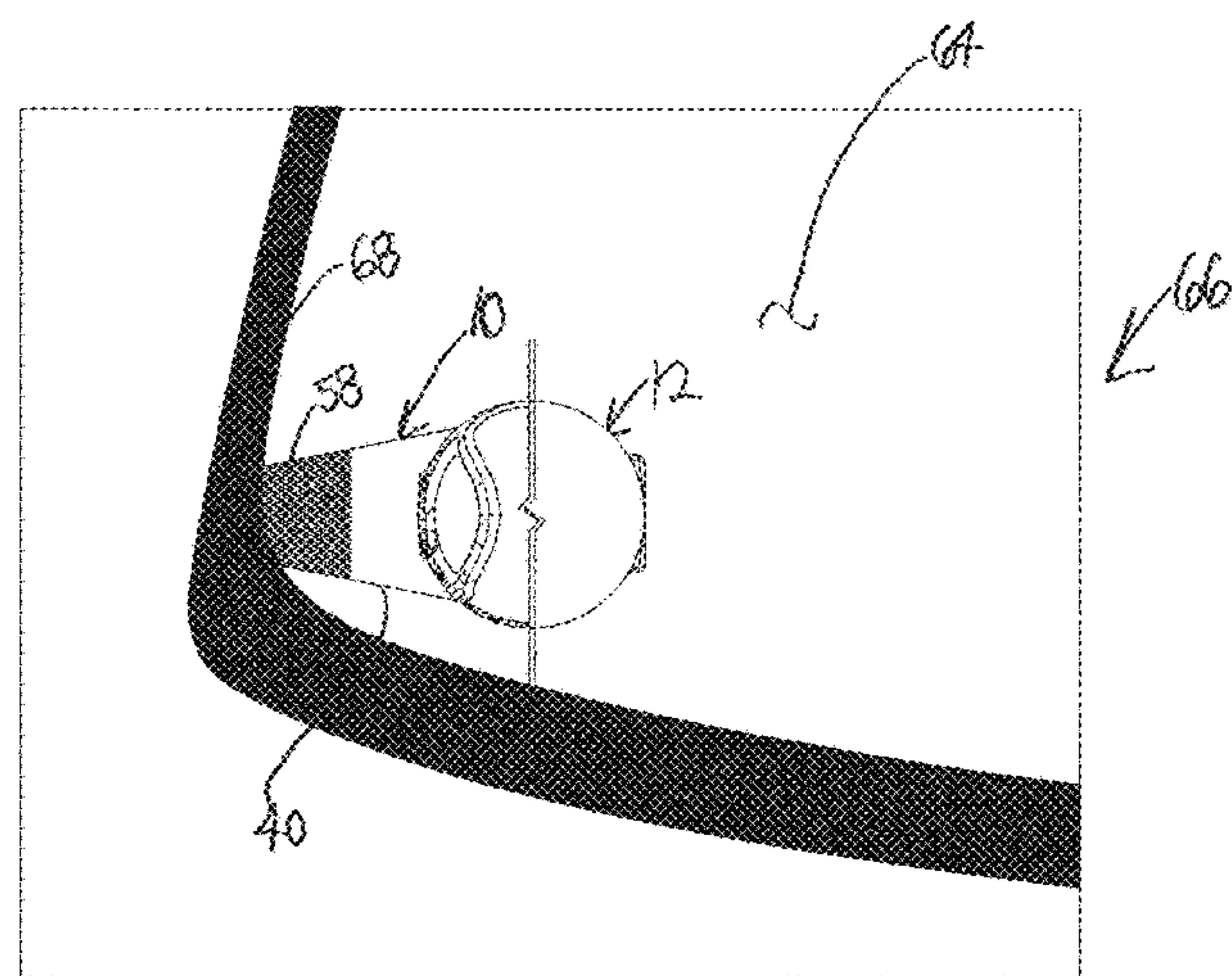
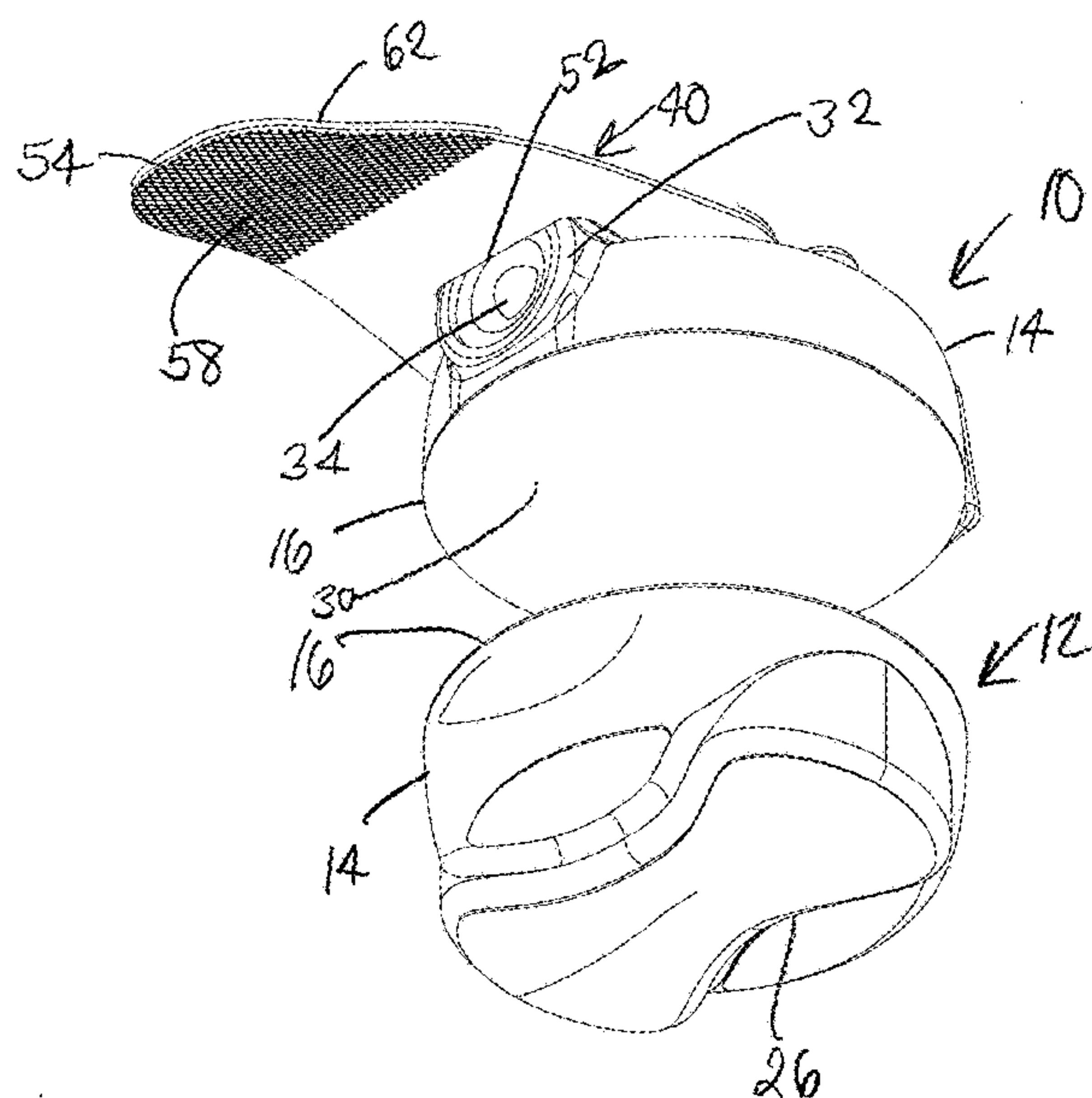
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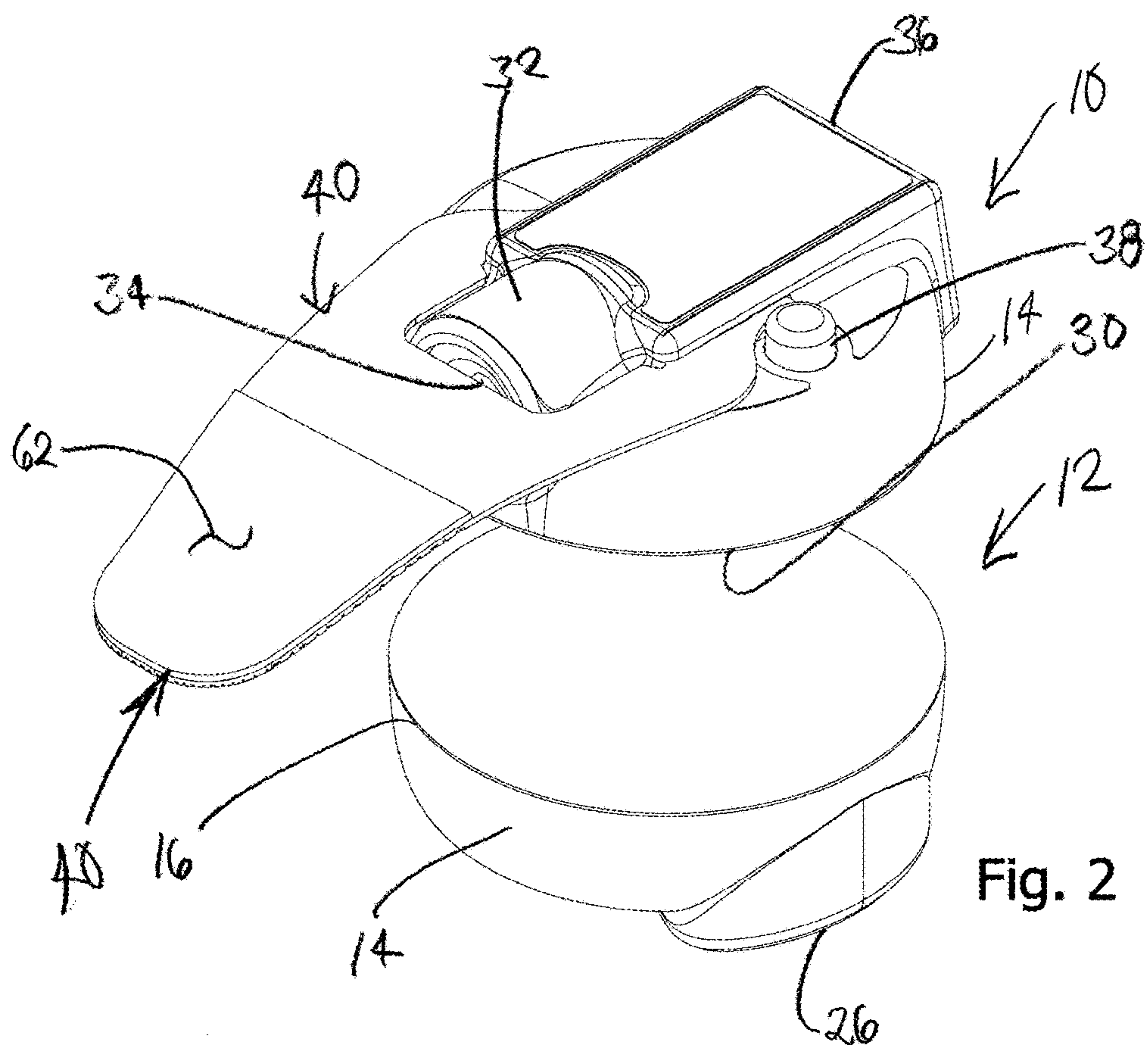
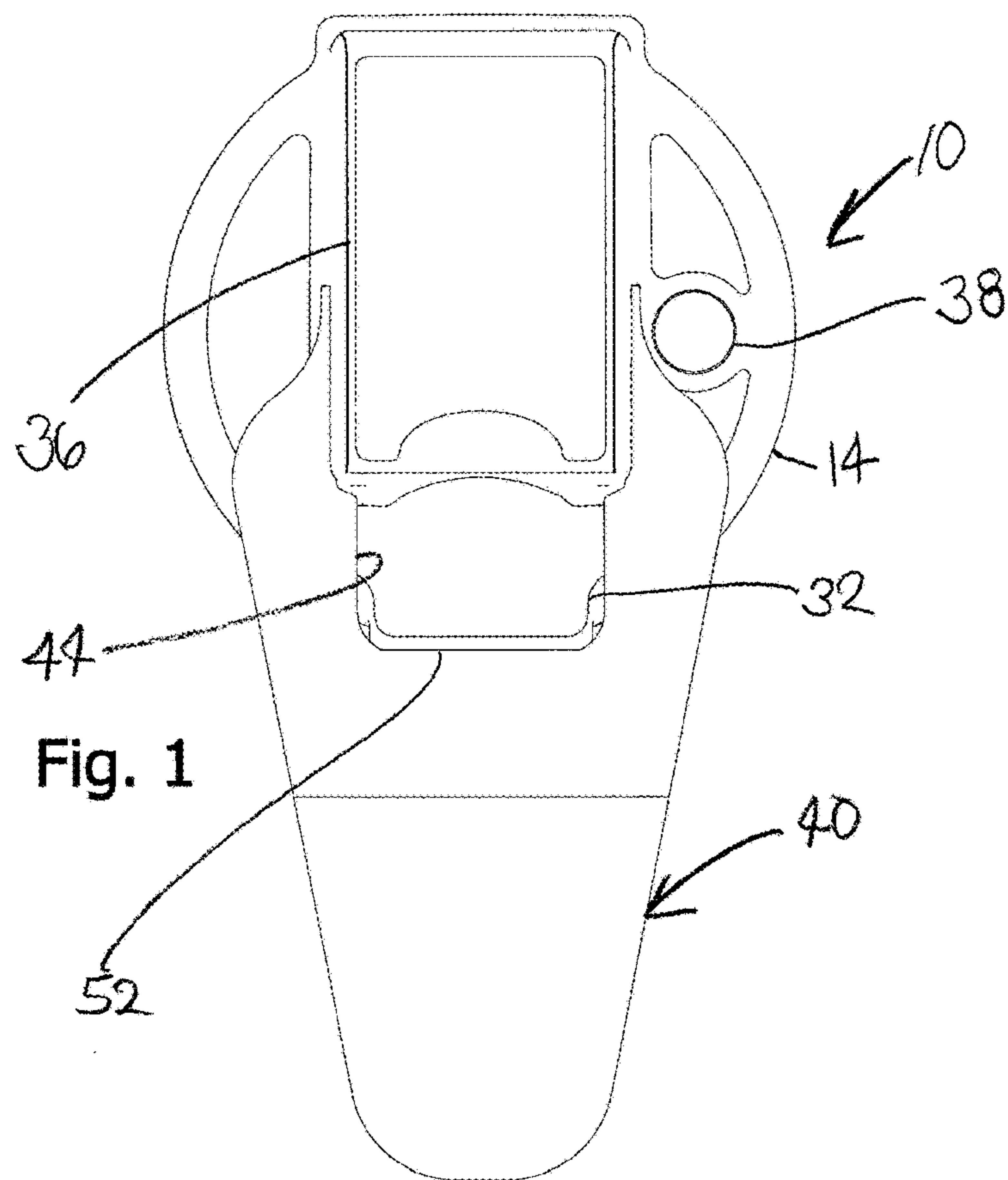
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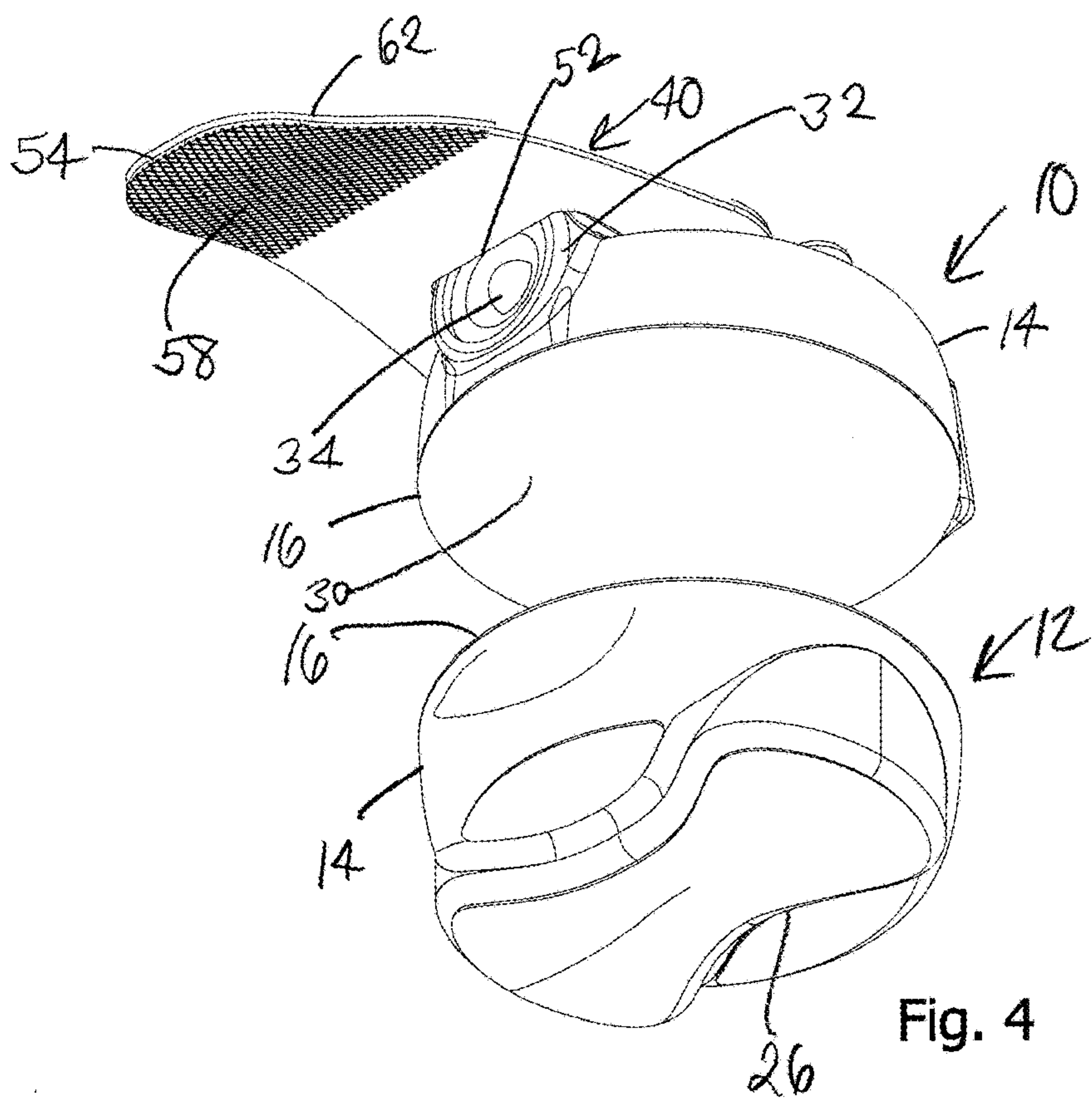
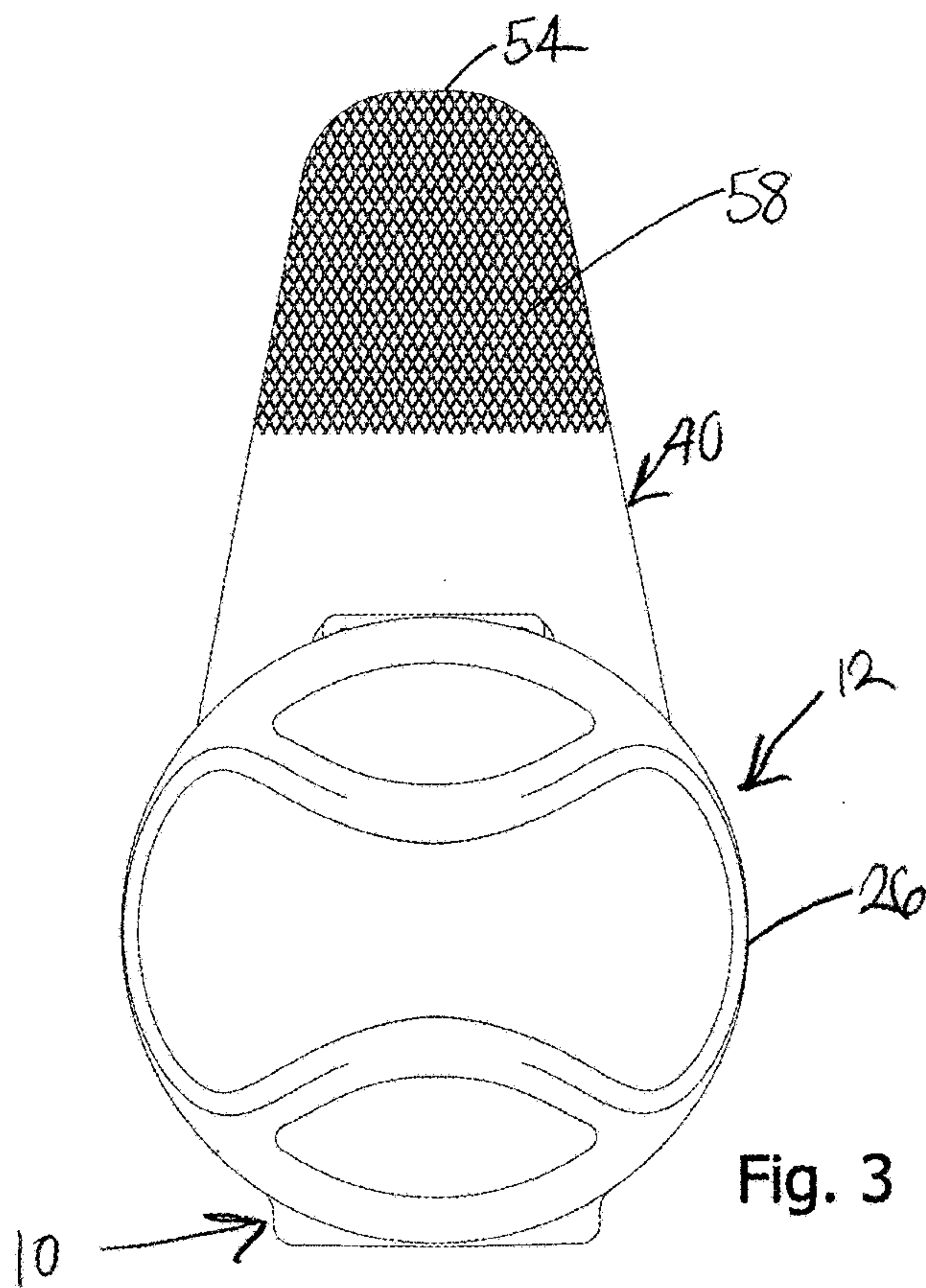
(57) **ABSTRACT**

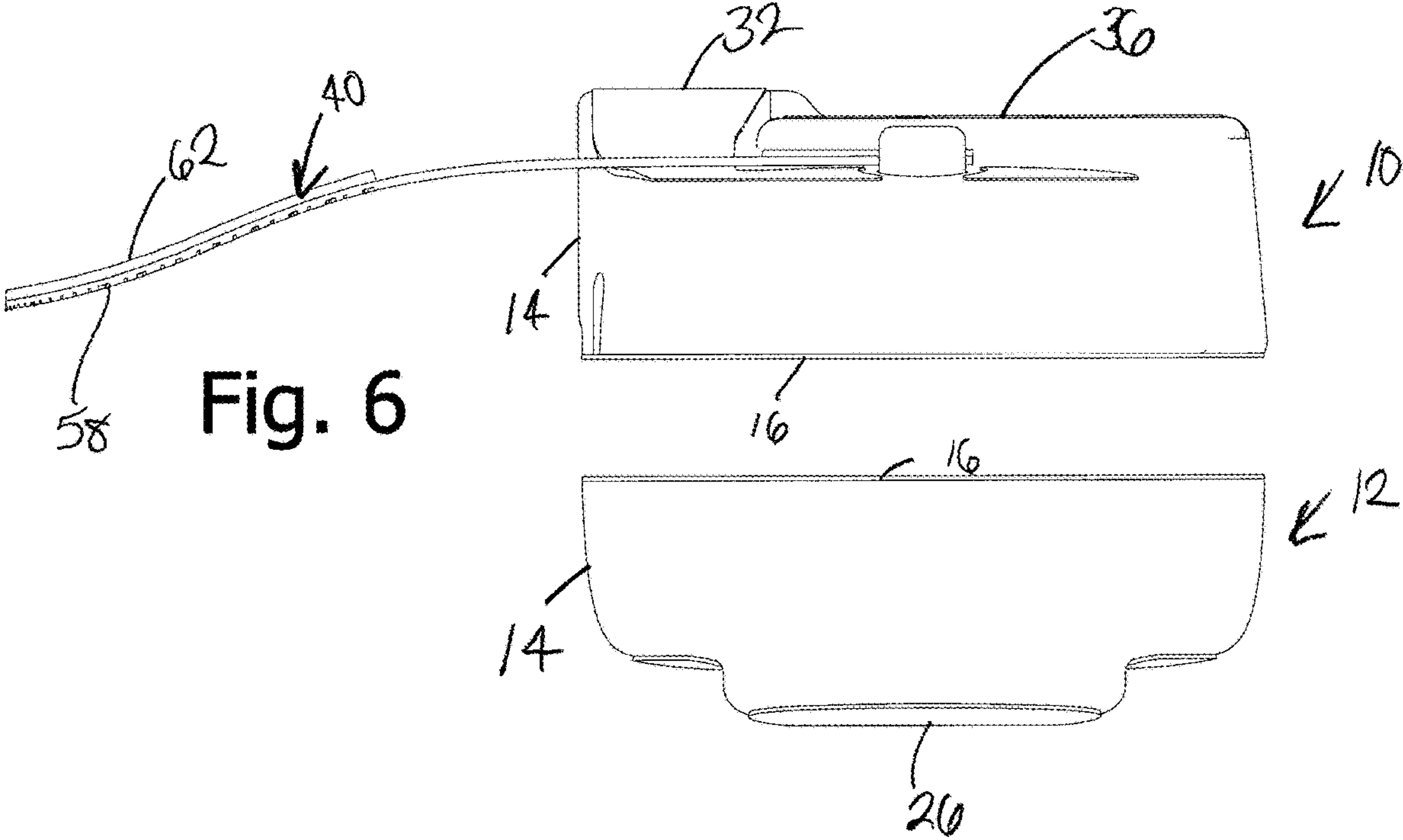
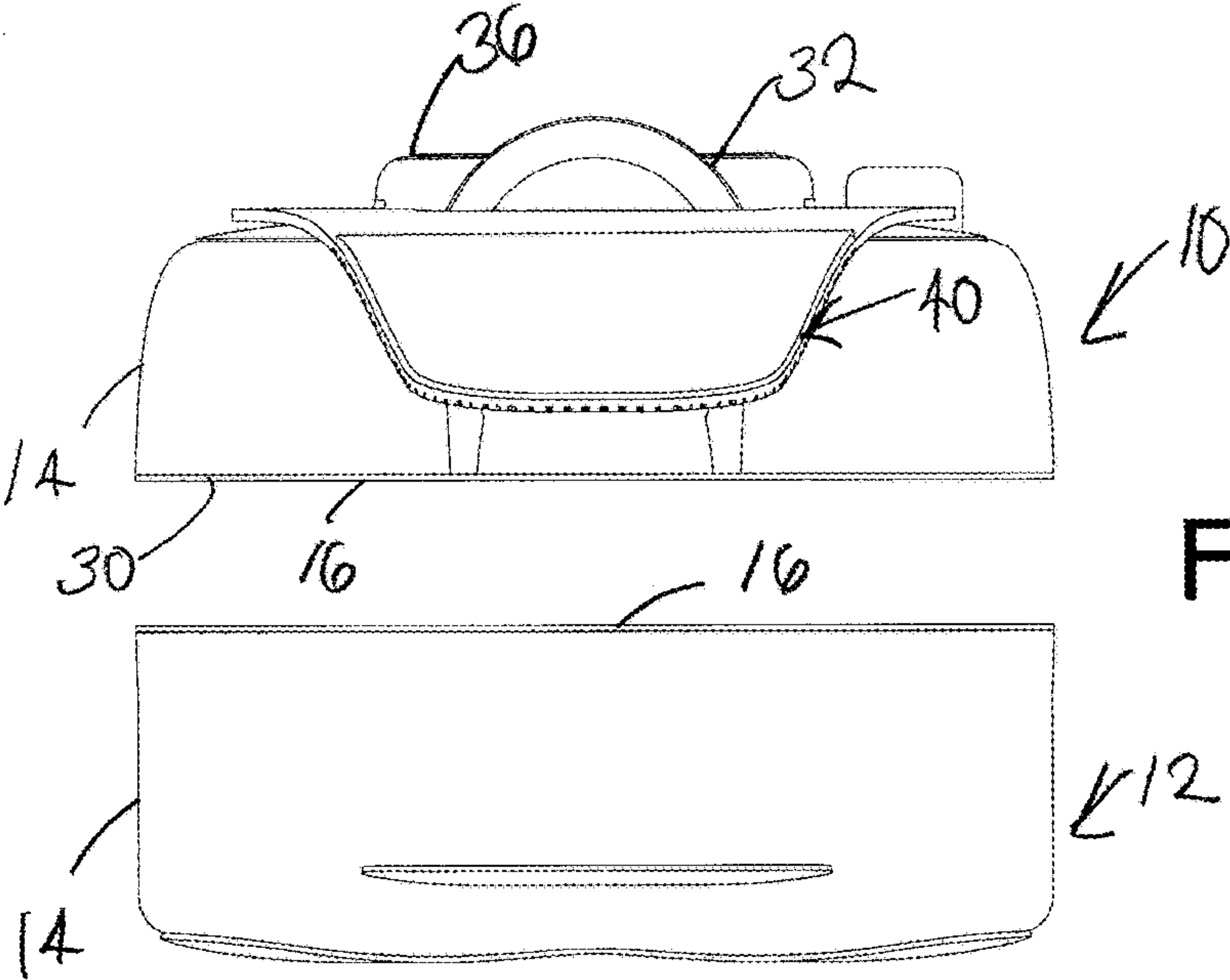
A magnetic light system for illuminating a black line around a windshield from the inside of the windshield with an inner magnetic member movable along the black line with an outer magnetic member for use in cutting a window tint. The inner magnetic member has a light guide that channels light from an LED to a diffuser at a curved end that focuses the light on the black line. The magnetic components of the inner and outer magnetic members have magnetic field directionality such that the light guide may be rotated and steered along the black line by the outer magnetic member.

12 Claims, 8 Drawing Sheets









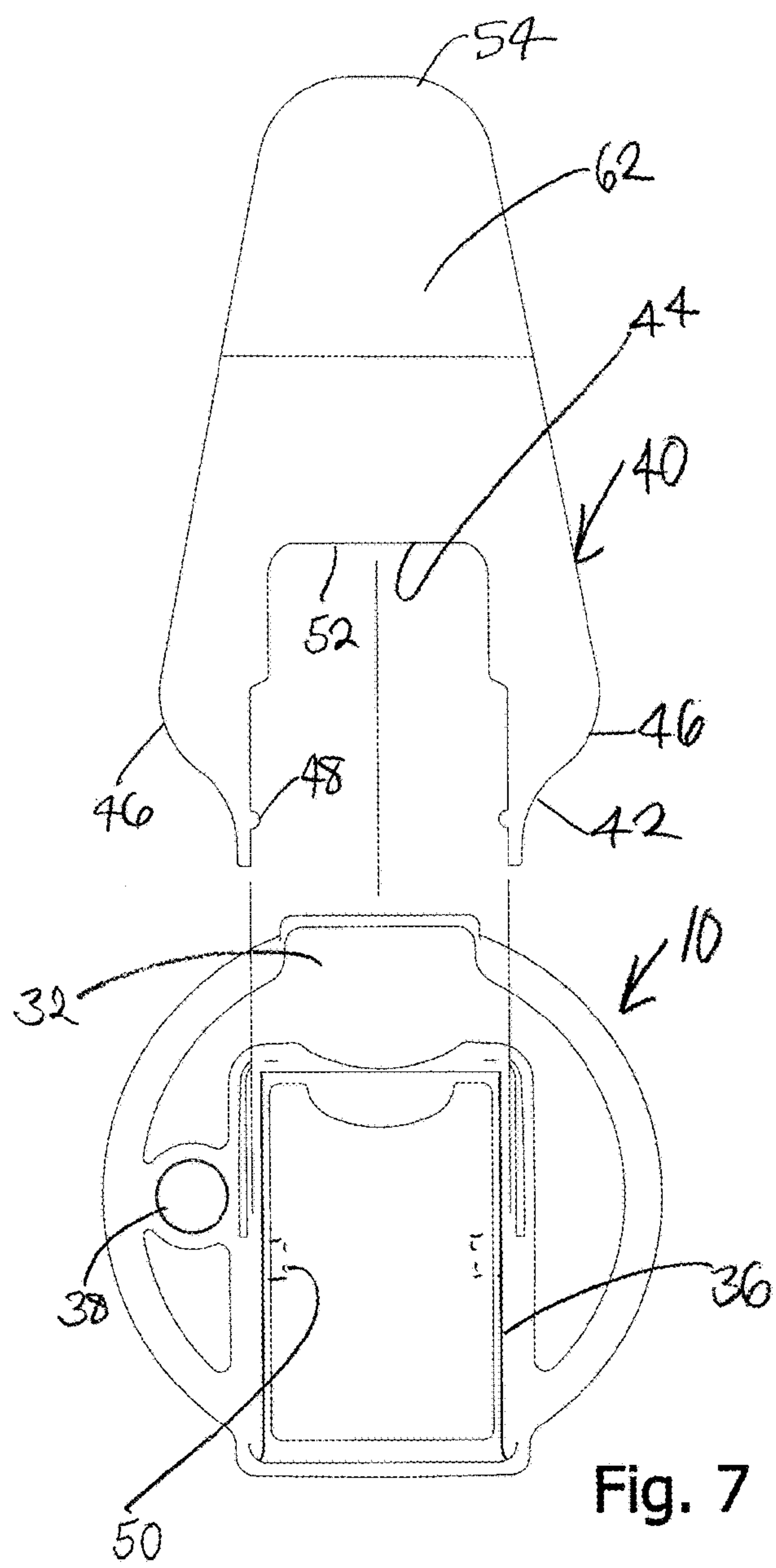


Fig. 7

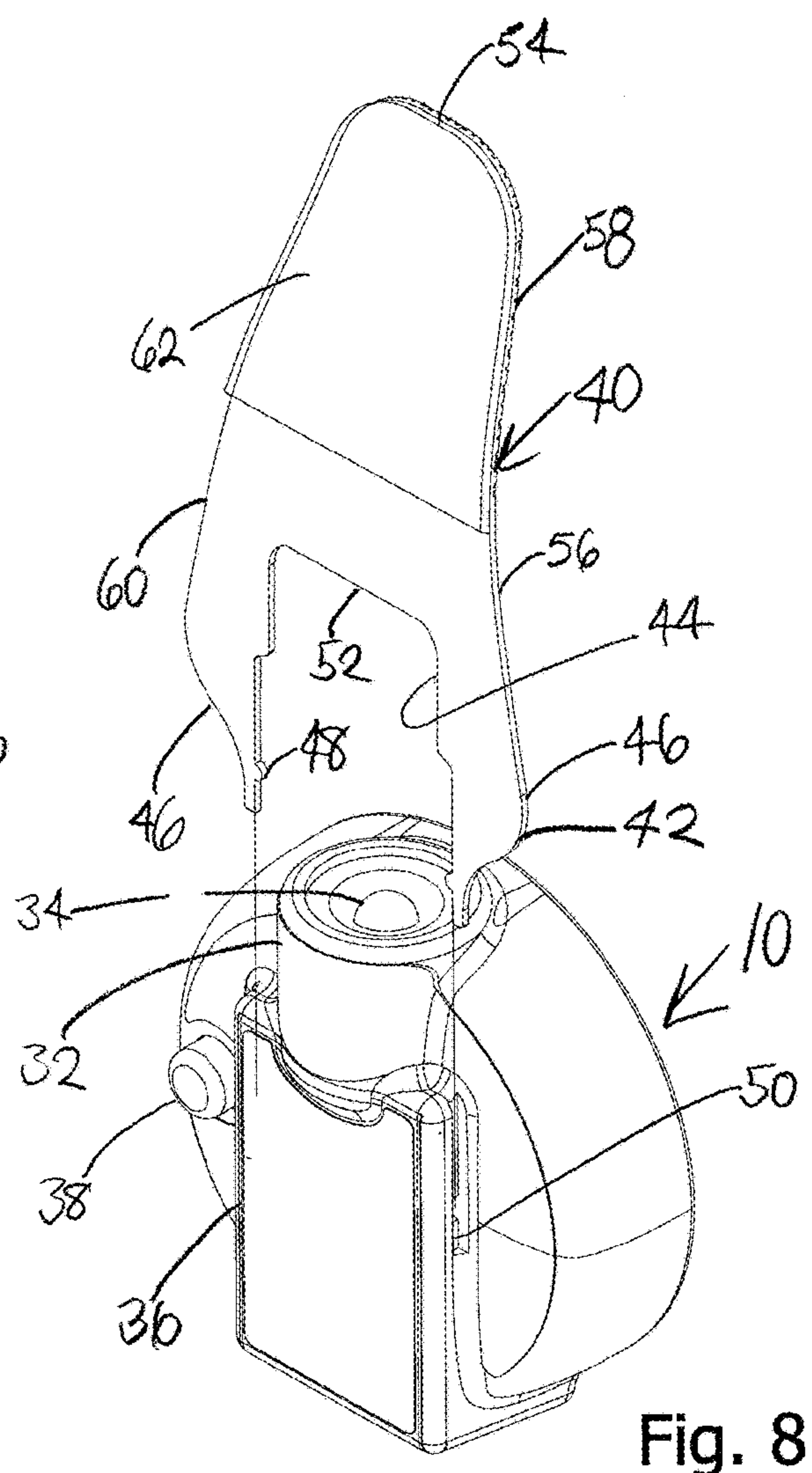
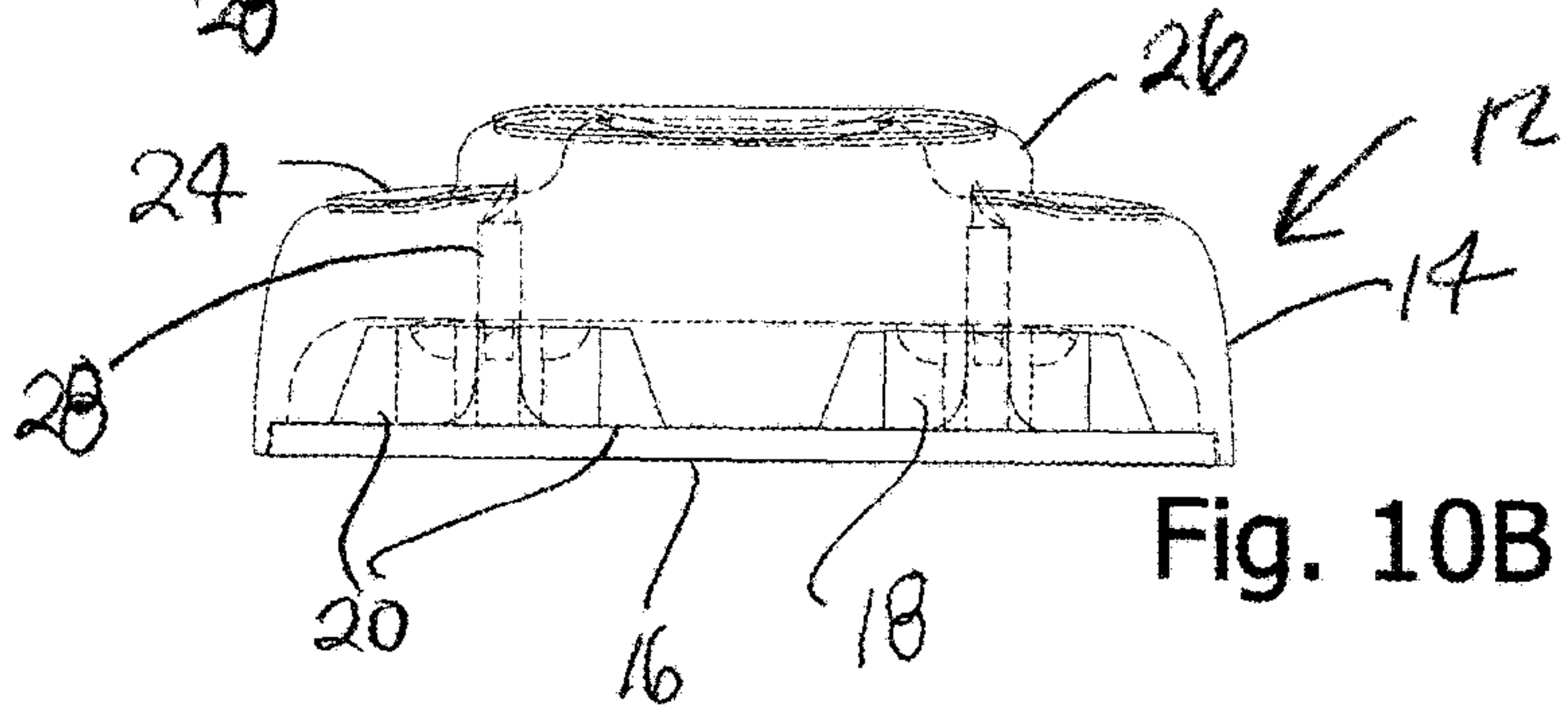
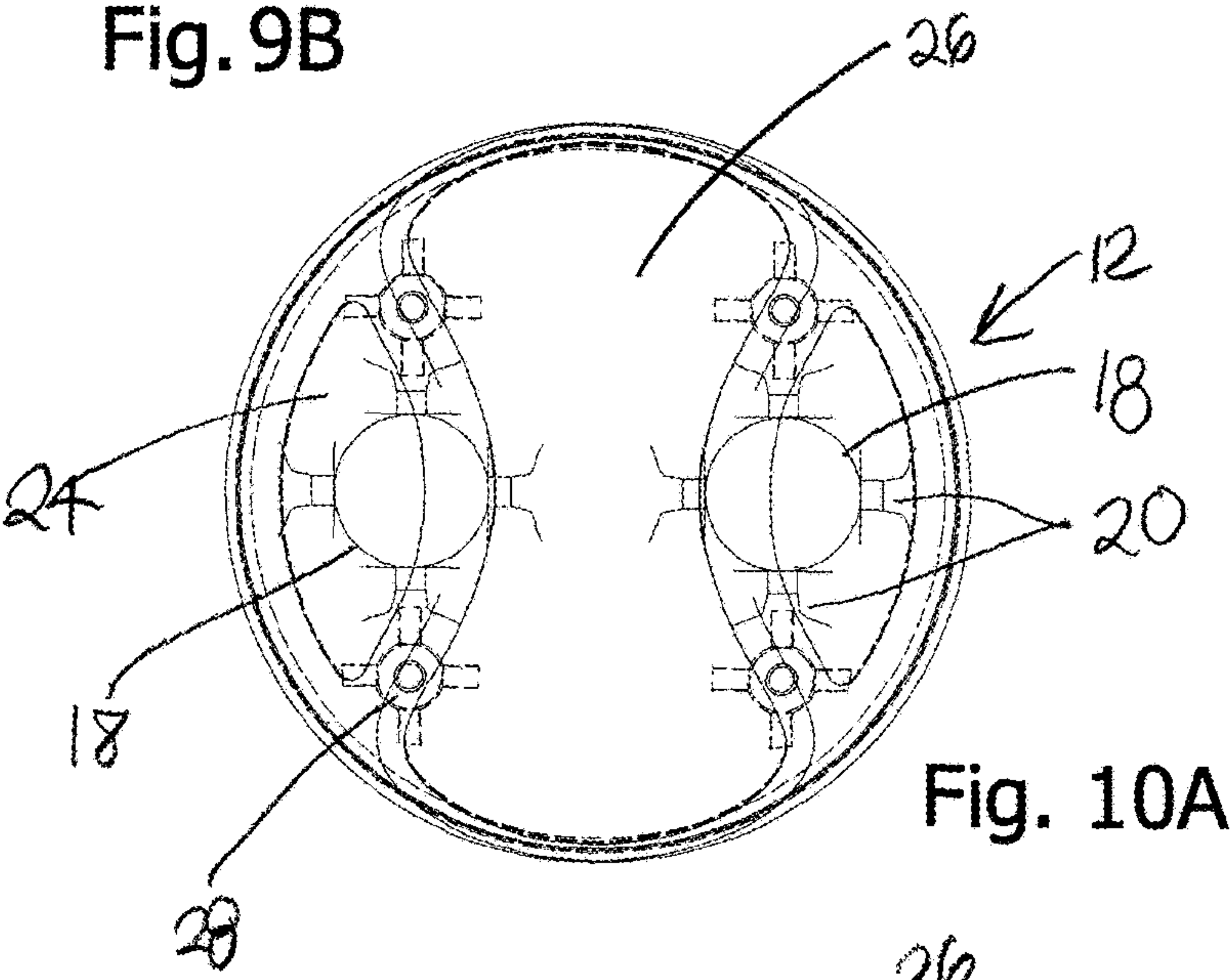
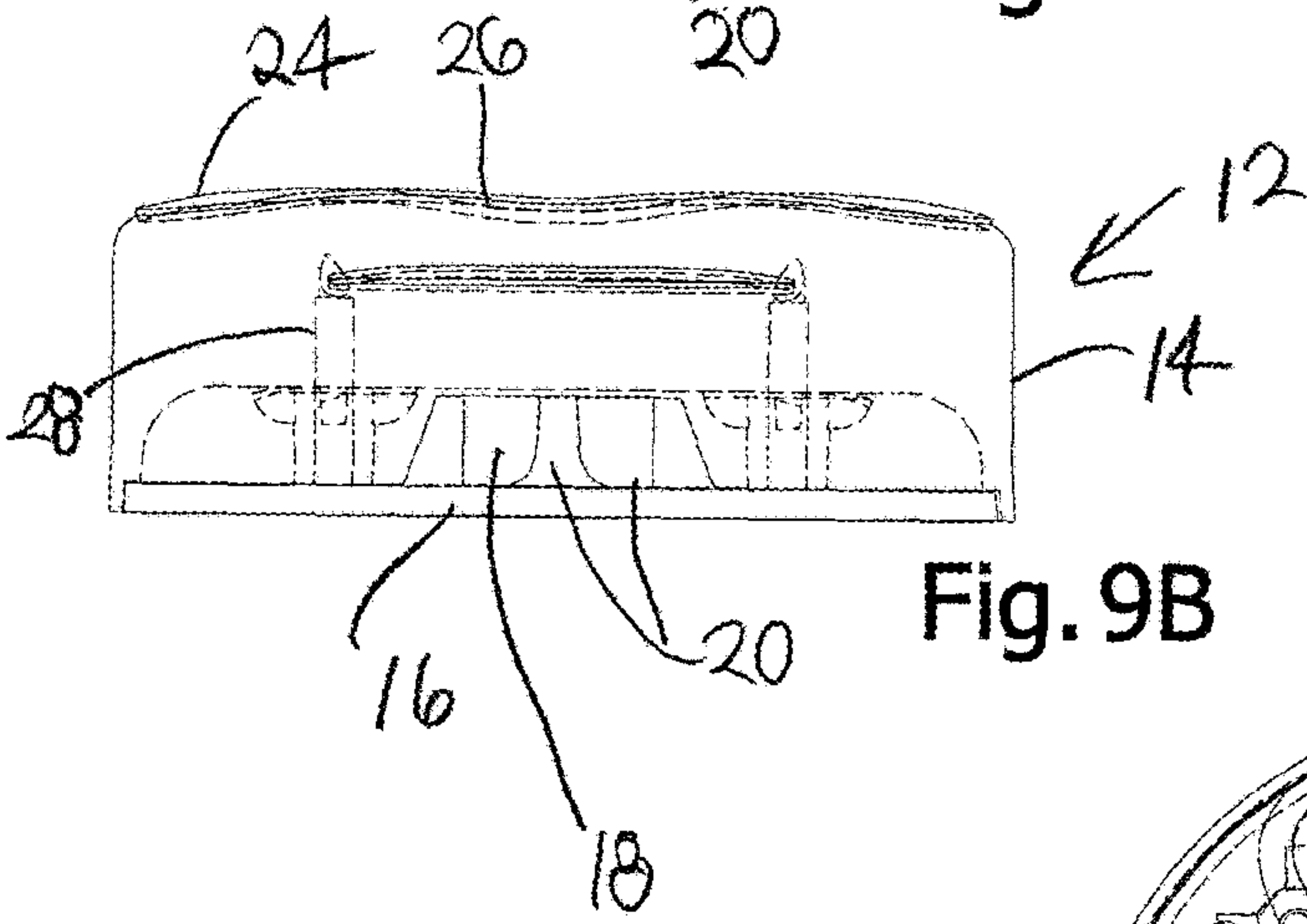
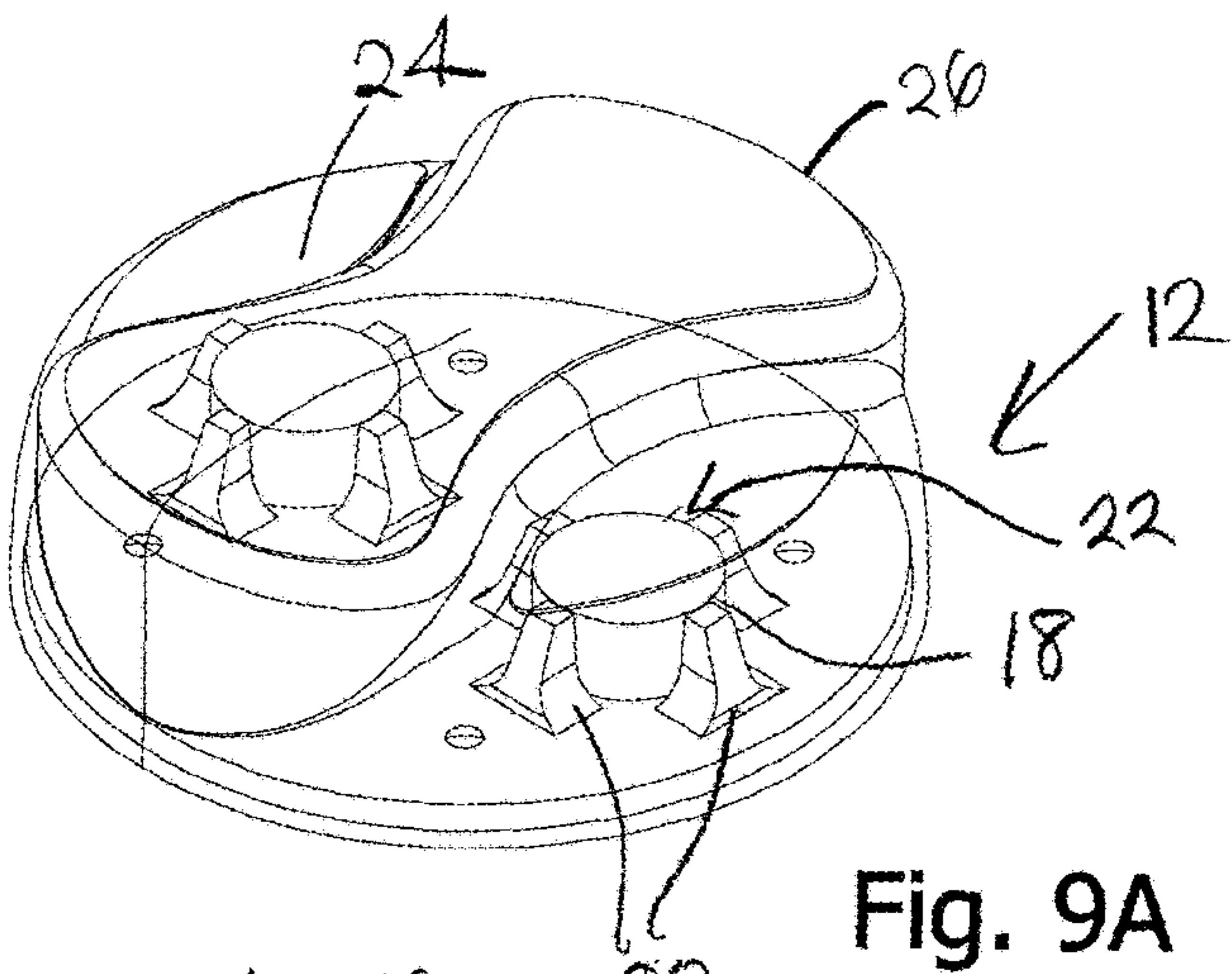
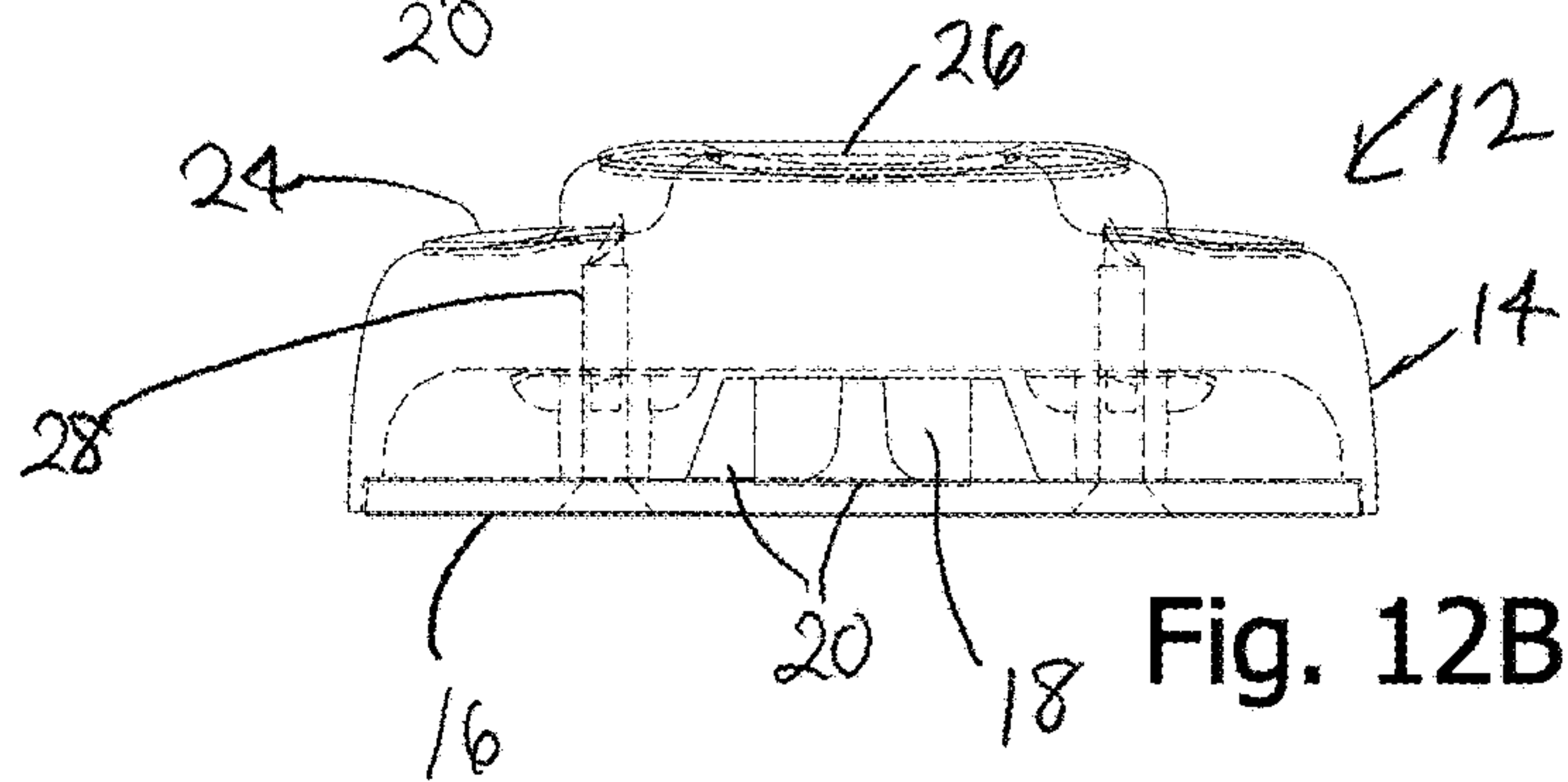
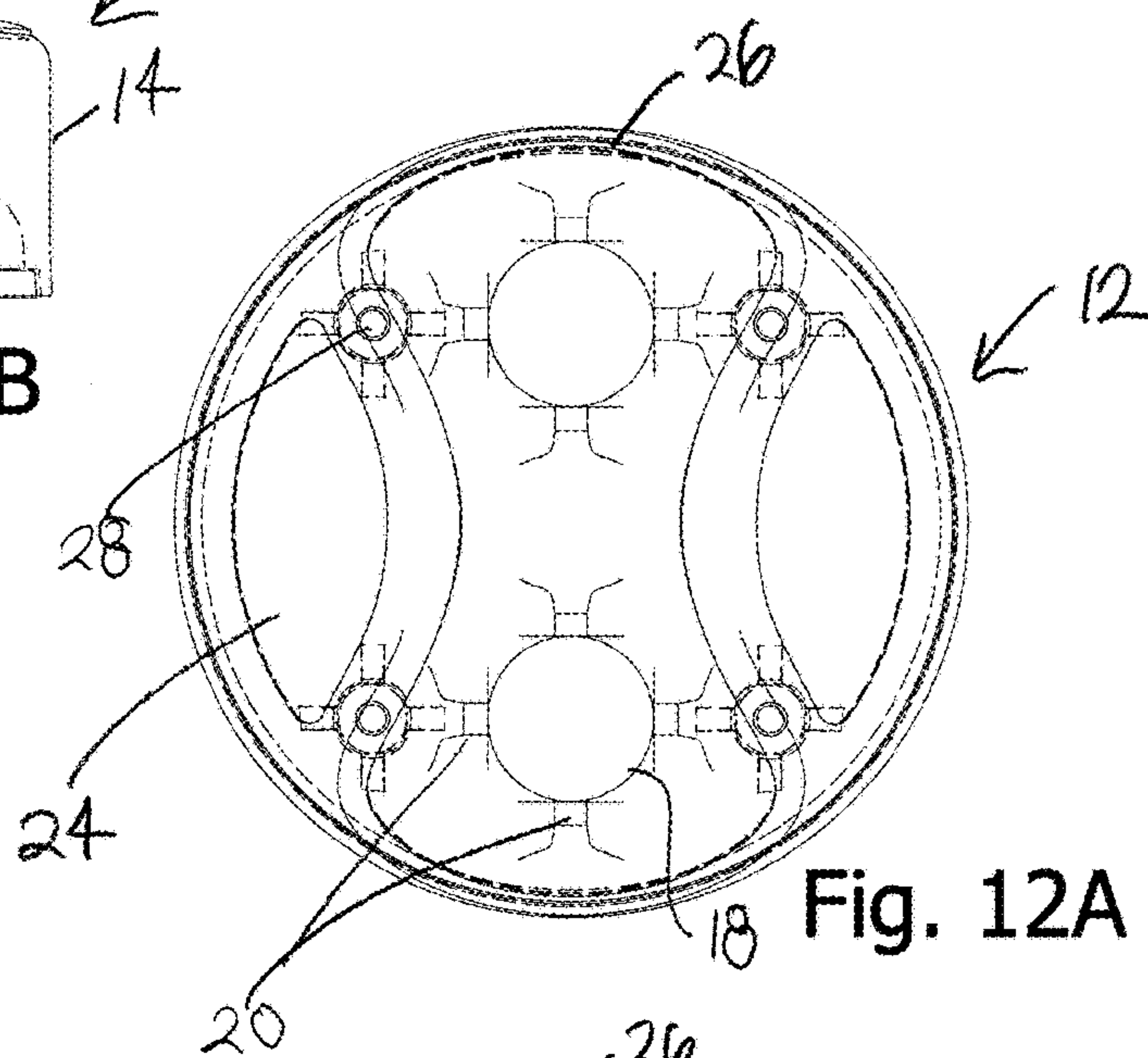
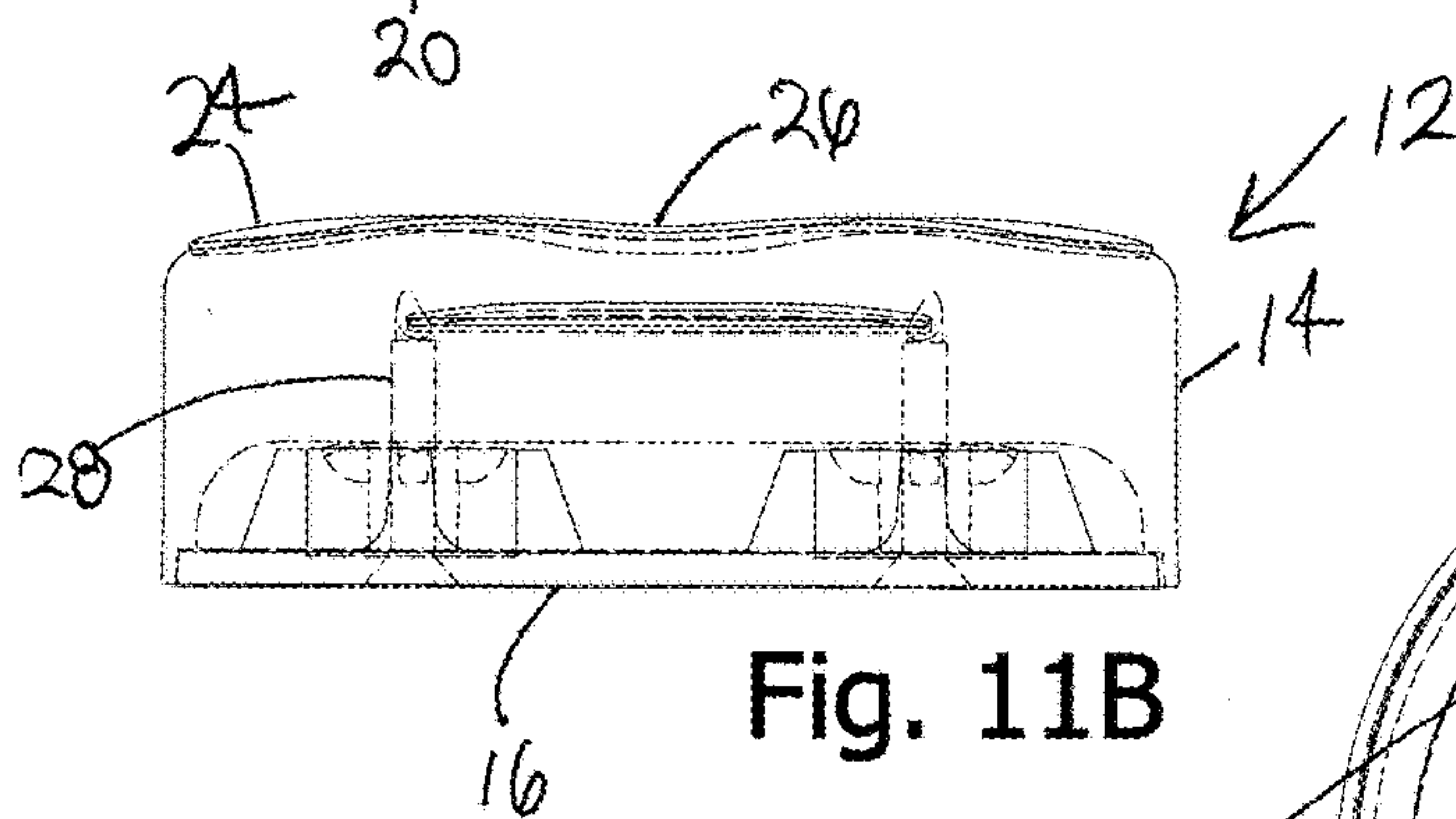
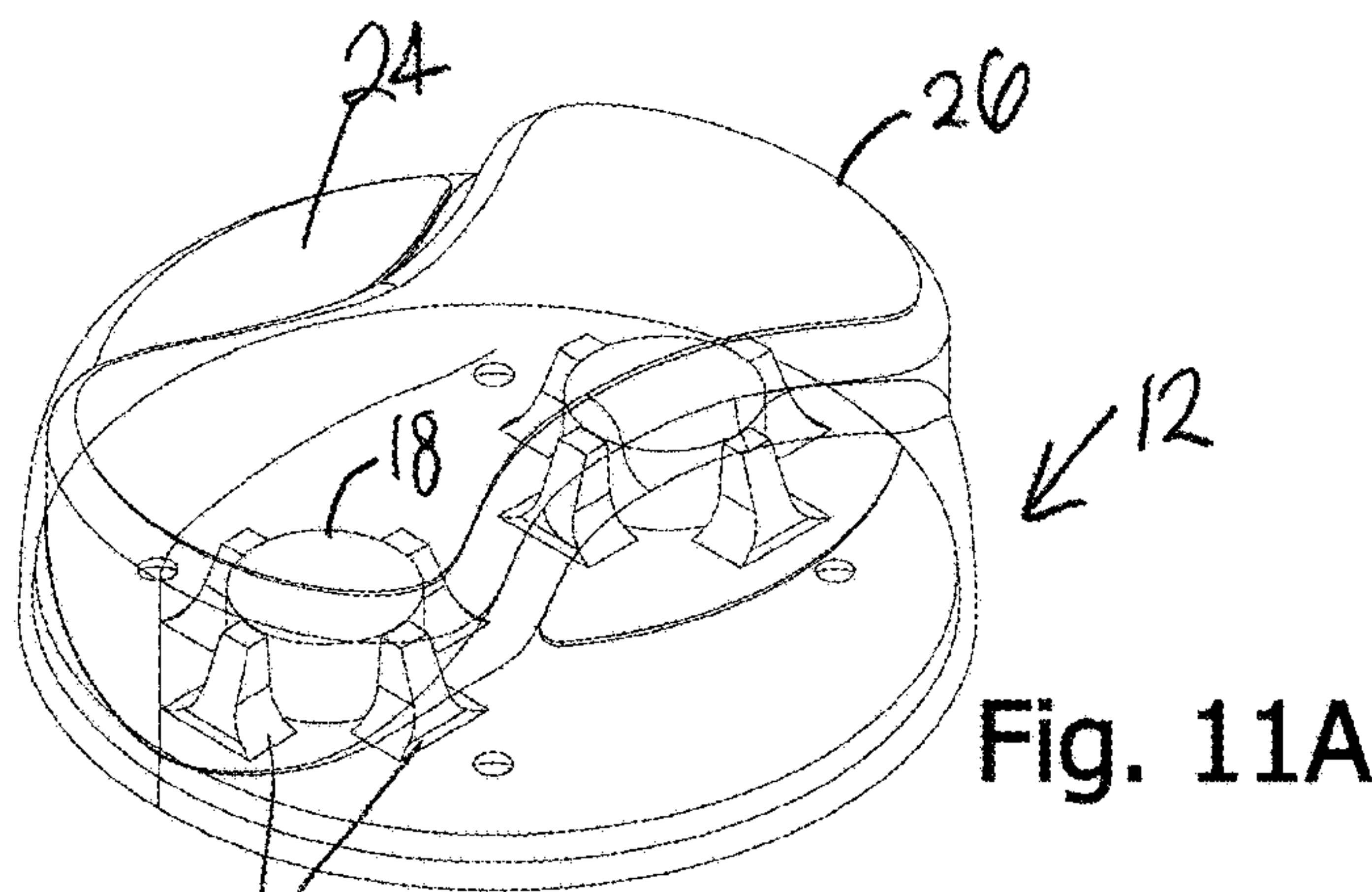
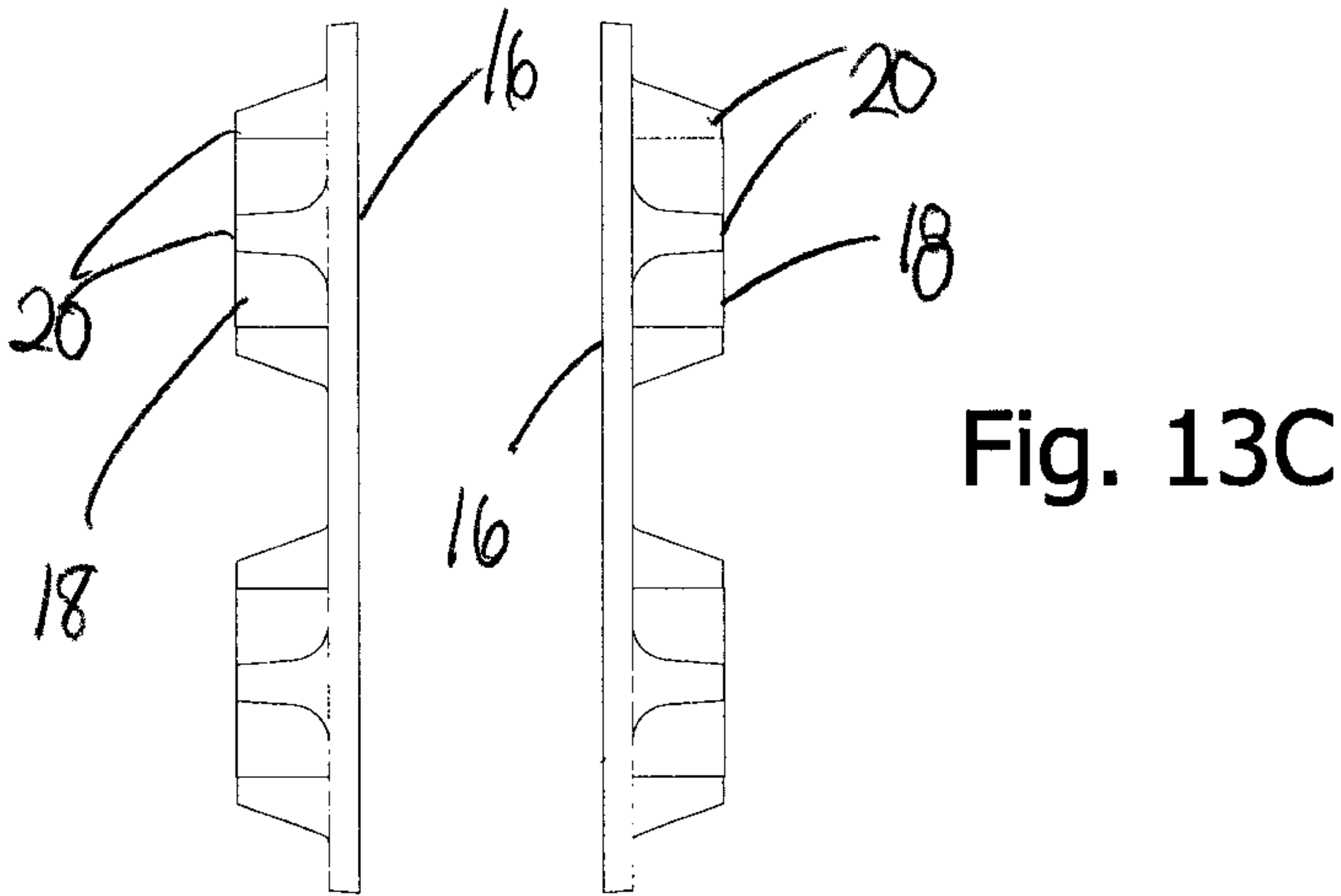
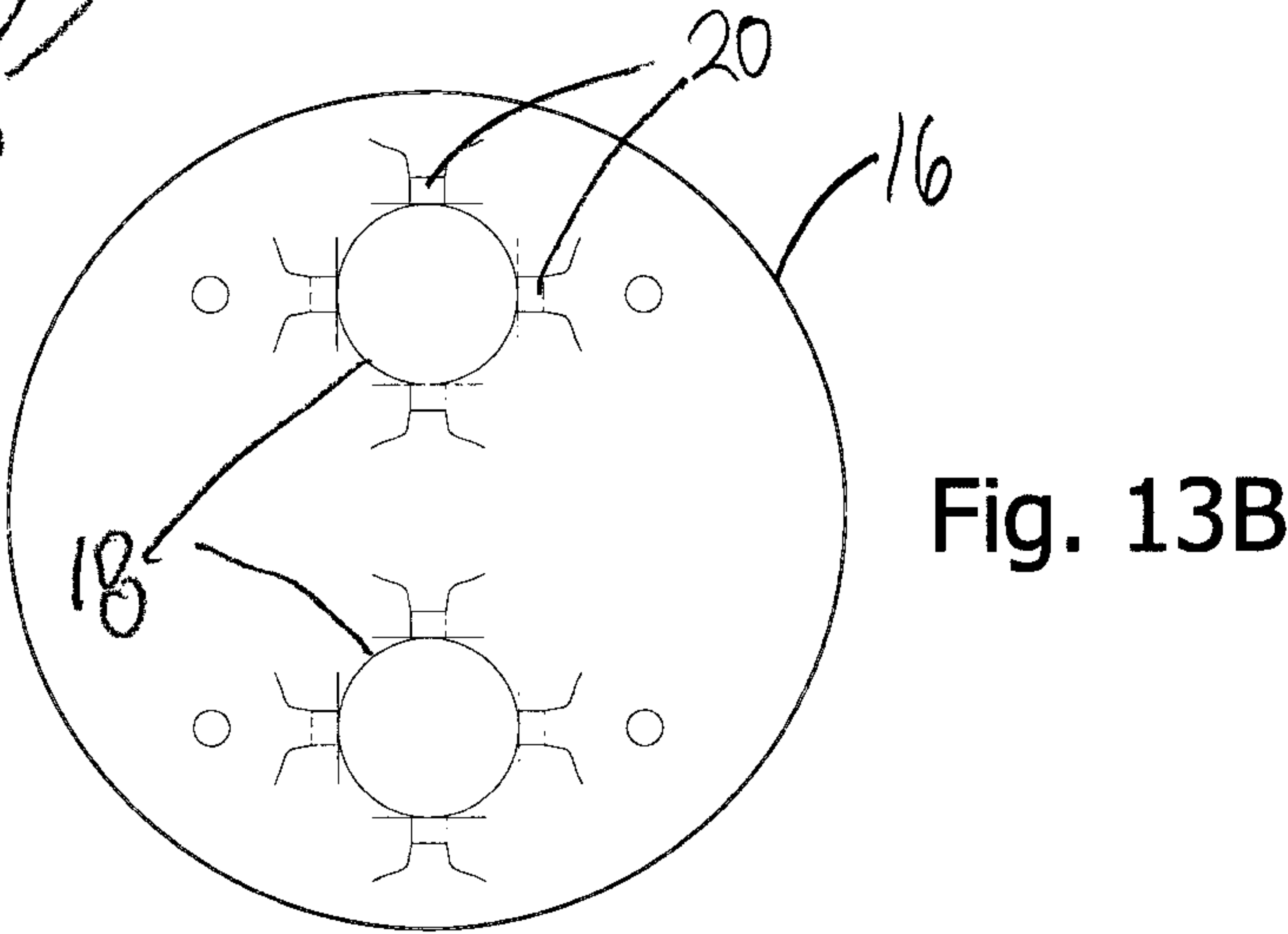
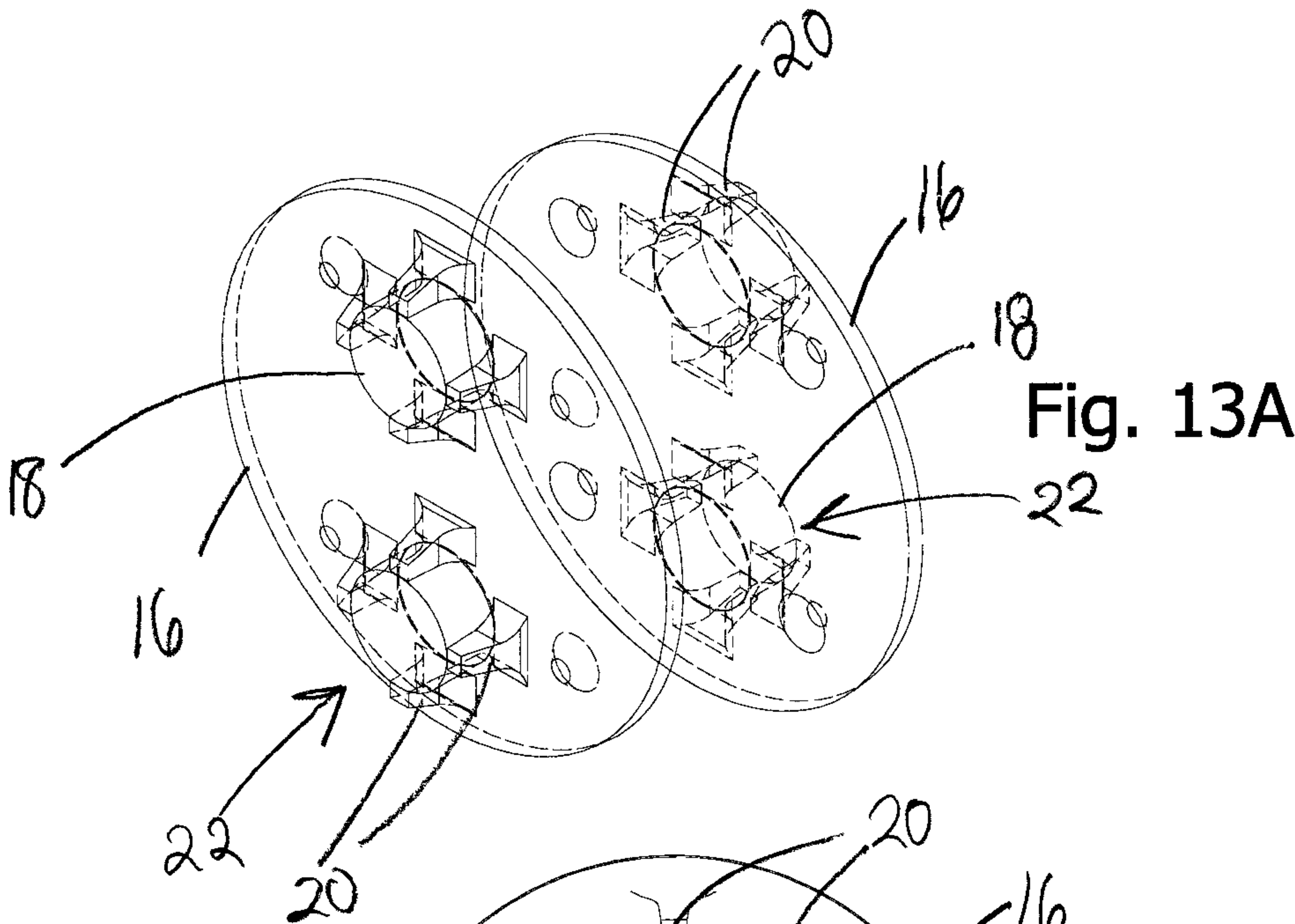


Fig. 8







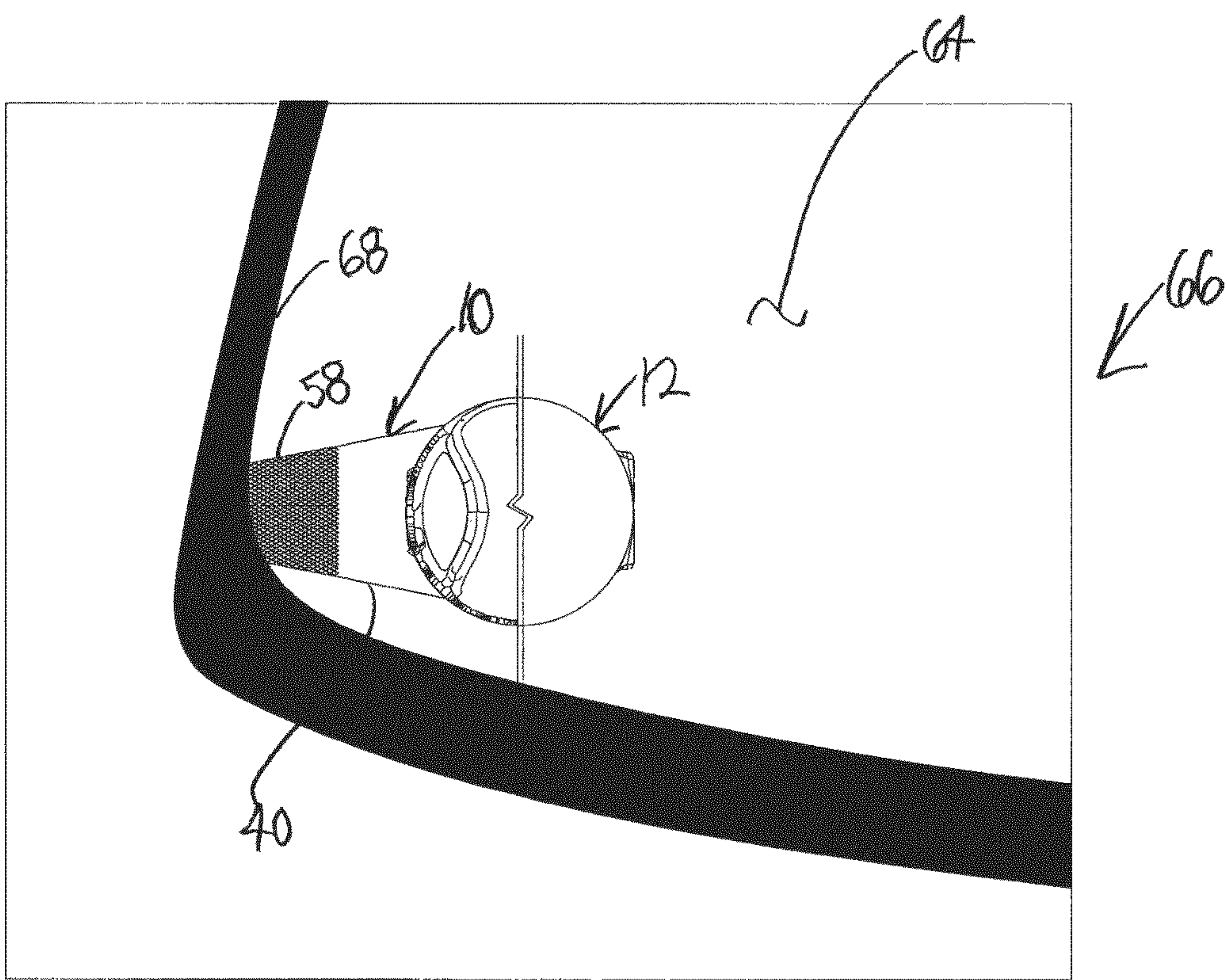


Fig. 14

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MAGNETIC LIGHT SYSTEM FOR ILLUMINATING THE MARGINS OF A WINDSHIELD

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a magnetic light system for use in cutting a film for attachment to the inside of a car window.

Brief Description of the Prior Art

When a film is applied to a window of a car, the window is wetted on the outside and a sheet of film pressed against the glass. There is a black rim around the glass on the inside that is visible from the outside of the glass. Ideally the film is precisely cut along the black line and then installed on the inside of the window. The problem is seeing the black line through the film.

What is needed is a light on the inside of the window focused on the black line and moved along the line as the film is cut from the outside. While there have been magnetic light systems proposed in the past (e.g., U.S. Pat. No. 11,112,097), the light was too diffuse to properly see the black line. The present invention provides a light system that shines a bright light more effectively on the black line where it is needed.

SUMMARY OF THE INVENTION

The present invention relates to an improved magnetic light system for illuminating a black line around a windshield from the inside of the windshield. The system includes an inner magnetic member and an outer magnetic member. The inner magnetic member has a light directed into a light guide. The light guide has a diffuser at a distal end for focusing the light on the black line.

In some embodiments the light is a LED and the light guide is an elongated, tapered member with a concave recess with a flat section seated flush in front of the LED to maximize flux. The concave recess is flanked by wing-like side sections at the entrance end of the light guide to minimize light scatter and to attach the light guide to the inner magnetic member.

In other embodiments, the inner and outer magnetic members have a hollow generally cylindrical shape attached to a base plate with magnetic components having a magnetic field with longitudinal directionality. In a specific embodiment a pair of magnets facing magnetically in the same direction are mounted on the base plate. The magnets on the outer magnetic member and the magnets on the inner magnetic member are positioned such their poles are complementary when the bottom plates of the inner and outer members are on opposite sides of the windshield.

In particular cases, the diffuser lines form a grid with a reflective surface on the opposite side of the light guide and the light guide is curved or bent at the distal end to focus the emitted light.

The invention is not limited to be specific features mentioned in this section but relates to all possible combination of features disclosed in the following sections.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

In the accompanying drawings in which one of various possible embodiments of the invention is illustrated, corre-

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sponding reference characters refer to corresponding parts throughout the several views of the drawings in which:

FIG. 1 is a top view of a magnetic light system including inner and outer magnetic members as viewed from the inner magnetic member side;

FIG. 2 is an exploded perspective view of the system as viewed from above the inner magnetic member;

FIG. 3 is a bottom view of the system as viewed from the outer magnetic member side;

FIG. 4 is an exploded perspective view of the system as viewed from below the outer magnetic member;

FIG. 5 is a front exploded view of the system;

FIG. 6 is a side exploded view of the system;

FIG. 7 is a top view of the inner magnetic member shown with a light guide detached;

FIG. 8 is a perspective view of the inner magnetic member shown with the light guide detached;

FIG. 9A is an x-ray perspective view of magnets seated on a bottom plate of the outer magnetic member with the magnets positioned transverse a handle;

FIG. 9B is an x-ray side view with the magnets positioned transverse the handle;

FIG. 10A is an x-ray top view of the magnets seated transverse the handle;

FIG. 10B is an x-ray front view of the magnets seated transverse the handle;

FIG. 11A is an x-ray perspective view of the magnets seated on the bottom plate of the outer magnetic member with the magnets positioned in alignment with the handle;

FIG. 11B is an x-ray side view with the magnets seated in alignment with the handle;

FIG. 12A is an x-ray top view of the magnets seated in alignment with the handle;

FIG. 12B is an x-ray front view of the magnets seated aligned with the handle;

FIG. 13A is an x-ray perspective view of the magnets seated on the bottom plate of the inner and outer magnetic members;

FIG. 13B is a top view of the magnet members seated on the bottom plate;

FIG. 13C is a side view of the magnets seated on the bottom plate of the inner and outer magnetic members; and,

FIG. 14 is a view of the system in use on a windshield as viewed from the outside.

DETAILED DESCRIPTION OF AT LEAST ONE PREFERRED EMBODIMENT OF THE INVENTION

A magnetic light system comprises an inner magnetic member 10 and an outer magnetic member 12 formed of a plastic material such as ABS or similar material. As shown in the drawings, each of the inner and outer magnetic members 10, 12 comprises a generally cylindrical body with smooth or flattened sides such as a puck 14 attached to a bottom plate 16 on which a magnetic component such as a row of magnets or a bar magnet with longitudinal directionality is mounted. With continuing reference to the drawings, two magnetic members 18 are mounted on bottom plate 16 preferably facing in the same magnetic direction. As best seen in FIGS. 13A-13C, a plurality of upwardly extending spaced apart fingers 20 form a receiving slot 22 within which a coin shaped magnet 18 is seated and retained. Magnets 18 on bottom plate 16 of inner magnetic member 10 and those on bottom plate 16 of outer magnetic member 12 are arranged such that their complimentary poles are facing. Suitable magnets 18 may be rare earth permanent magnets

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such neodymium iron boride magnets. However, it should be appreciated that one or more of magnets **18** may be replaced with ferrous materials, such as iron, steel or the like, to magnetically couple with magnets **18**.

With specific reference to outer magnetic member **12**, a top surface **24** of puck **14** may include a molded handle **26** for comfort and ease of use. More particularly, handle **26** may have an hourglass shape contoured to give ergonomic support to a user's fingers and be textured for better grip. Bottom plate **16** is attached to puck **14** with threaded members **28** such that the orientation of magnets **18** may be aligned with a long axis of handle **26** as shown in FIGS. **11A-11B** and **12A-12B** or be position transverse to handle **26** as shown in FIGS. **9A-9B** and FIG. **10A-10B**.

Turning to inner magnetic member **10**, bottom plate **16** like that of outer magnetic member **12** is flat but in addition has a non-abrasive, slip-inducing cover **30** such that a user may move inner magnetic member **10** easily along an inner surface of a windshield. The flatness of bottom plate **16** also contributes to easy movement as a windshield usually has some inward curvature such that bottom plate **16** makes only minimal contact with the glass around the periphery of the bottom plate. Outer magnetic member **10** may also have a low friction material on the bottom plate such that it does not scratch the film or the glass. In addition flat bottom plate **16** is slightly elevated because of the curvature of the glass such that it glides over a piece of debris stuck on the glass under the film.

A socket **32** facing forward is provided on top surface **24** of puck **14** for a light **34** which may be an LED. Light **34** is powered by a battery (not shown) housed in a compartment **36** provided on top surface **24**. Compartment **36** is aligned with the outer surface of socket **32** to facilitate gripping and movement of inner magnetic member on the inside of the windshield. A light switch **38** such as a push button on/off plunger is provided on the top surface to activate the LED light. Light **34** is embedded in socket **32** for use as described below.

A light guide **40** best seen in FIGS. **7-8** is formed from a sheet of plastic material mounted on inner magnetic member **10** with a first end **42** positioned in front of light **34**. To maximize light flux passed into light guide **40** and onto the windshield, light guide **40** is elongated with a concave recess **44** at first end **42**. Wing-like side sections **46** flank concave recess **44**. When light guide **40** is detachable side sections **46** include detents **48** which are received in receivers **50** provided in battery compartment **36**. Different length light guides **40** may thus be provided depending on the geometry of the window being treated. Flexibility in the light guide is also advantageous for reaching cramped areas such as the bottom of a rear car window. Concave recess preferably has a flat section **52** forming the entrance end of the light guide. Flat section **52** is positioned against socket **32** in close proximity to LED **34** for effective light capture. Side sections **46** also increase light flux. Light **34** may be embedded in light guide **40** or a lens may be positioned between the light and the entrance end of the light guide to minimize light scatter. In other embodiments light **34** may be a laser.

Light guide **40** tapers towards a second end **54** and may be straight or preferably curved towards a bottom surface **56**. Diffuse lines **58** best seen in FIGS. **3-4** are provided at second end **54**. Light within the light guide is internally reflected and preferably escapes only through diffuse lines **58**. As shown in the drawings, diffuse lines **58** may form of a grid and may be engraved or etched into bottom surface **56**. Second end **54** when curved concentrates the light distributed by diffuse lines **58** into a focused beam. A top surface

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60 above grid **58** may be coated with a white light reflective surface to reflect the diffused light back into the plate and out bottom surface **56**. Reflective surface **62** may be provided in the form of a tape.

Prior to use in the field, inner and outer magnetic members **10, 12** are housed side-by-side as the attraction between the complementary poles of magnets **18** is intense. In use, a tint film **64** may be applied to the outside of a windshield **66** and outer magnetic member **12** may positioned on the film towards a bottom edge of the windshield. Working from the inside inner magnetic member **10** may be brought into magnetic contact with outer magnetic member **12** through the glass and light **34** activated with switch **38**.

Working from the outside as shown in FIG. **14**, a user may move inner magnetic member **10** with outer magnetic member **12** such that a black line **68** that runs around a windshield may be illuminated and the film may be cleanly cut along the line. During use, inner and outer magnetic members **10, 12** slide easily across the inside and outside of the windshield allowing for precise illumination of the black line exactly where the user needs it. The directionality of the magnetic field in inner and outer magnetic members **10, 12** permits a user to rotate the inner member with the outer member as well as precisely move the inner member along the inside of the glass to reach all the black line areas. Cutting shadows are eliminated ensuring a clean, accurate pattern thus avoiding costly miscut errors.

Depending on the handedness of a user or simply preference, magnets **18** in outer magnetic member **10** may be aligned with or transverse to handle **26**. This is done by detaching plate **16** from puck **14**, rotating the plate a quarter turn and reattaching plate **16** with threaded members **28** as shown in FIG. **11A-11B** and FIG. **12A-12B** (aligned with handle) and FIG. **9A-9B** and **10A-10B** (transverse to handle).

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A magnetic light system for illuminating a black line around a windshield from an inside of the windshield, said system comprising an inner magnetic member and an outer magnetic member, said inner magnetic member having a light directed into a light guide with first and second ends, said first end of the light guide positioned adjacent the light and a diffuser on a second end of the light guide for illuminating the black line, said inner magnetic member movable along the inside of the windshield from an outside of the windshield by the outer magnetic member.

2. The magnetic light system of claim 1 wherein each of said inner and outer magnetic members has a magnet or plurality of magnets having a magnetic field with longitudinal directionality.

3. The magnetic light system of claim 1 wherein each of said inner and outer magnetic members comprises a hollow body generally cylindrical in shape with a bottom plate on which is mounted a row of magnetic components facing in the same direction, said magnetic components on the inner and outer magnetic members arranged such that their complementary poles are facing when the bottom plates of the inner and outer magnetic members are on opposite sides of the windshield.

4. The magnetic light system of claim 1 wherein the light is an LED and the light guide is an elongated, tapered member having first and second ends.

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5. The magnetic light system of claim **4** wherein the light guide has a concave recess at the first end with a flat section seated in front of the LED, said concave recess flanked by wing-like side sections.

6. The magnetic light system of claim **5** wherein the side sections have detents and the inner magnetic member has receivers whereby the light guide is detachable from the inner magnetic member.

7. A magnetic light system for illuminating a black line around a windshield from an inside of the windshield, said system comprising an inner magnetic member and an outer magnetic member, each of said inner and out magnetic members comprising a hollow puck attached to a bottom plate on which is mounted first and second magnetic members facing in a same direction, said magnetic members on the inner and outer magnetic members arranged such that their complimentary poles are facing when the bottom plates of inner and outer magnetic members are on opposite sides of the windshield;

said inner magnetic member having a socket for an LED facing forward on a top surface aligned with a battery compartment, an elongated, tapered light guide having first and second ends, said first end positioned before the LED and said second end having diffusers on an underside of the light guide;

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said outer magnetic member having a top surface with an ergonomically shaped handle;

said inner magnetic member movable along the inside of the windshield from an outside of the windshield by the outer magnetic member.

8. The magnetic light system of claim **7** wherein the bottom plate of the outer magnetic member is attached to the puck with fasteners whereby the first and second magnets may be are aligned parallel or transverse a long axis of the handle.

9. The magnetic light system of claim **7** wherein the diffusers are arranged in a grid.

10. The magnetic light system of claim **9** wherein a reflective surface is attached to a top surface of light guide above the grid.

11. The magnetic light system of claim **7** wherein the light guide has a concave recess at the first end with a flat section seated in front of the LED, said concave recess flanked by wing-like side sections.

12. The magnetic light system of claim **11** wherein the side sections have detents and the battery compartment has receivers whereby the light guide is detachable from the inner magnetic member.

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