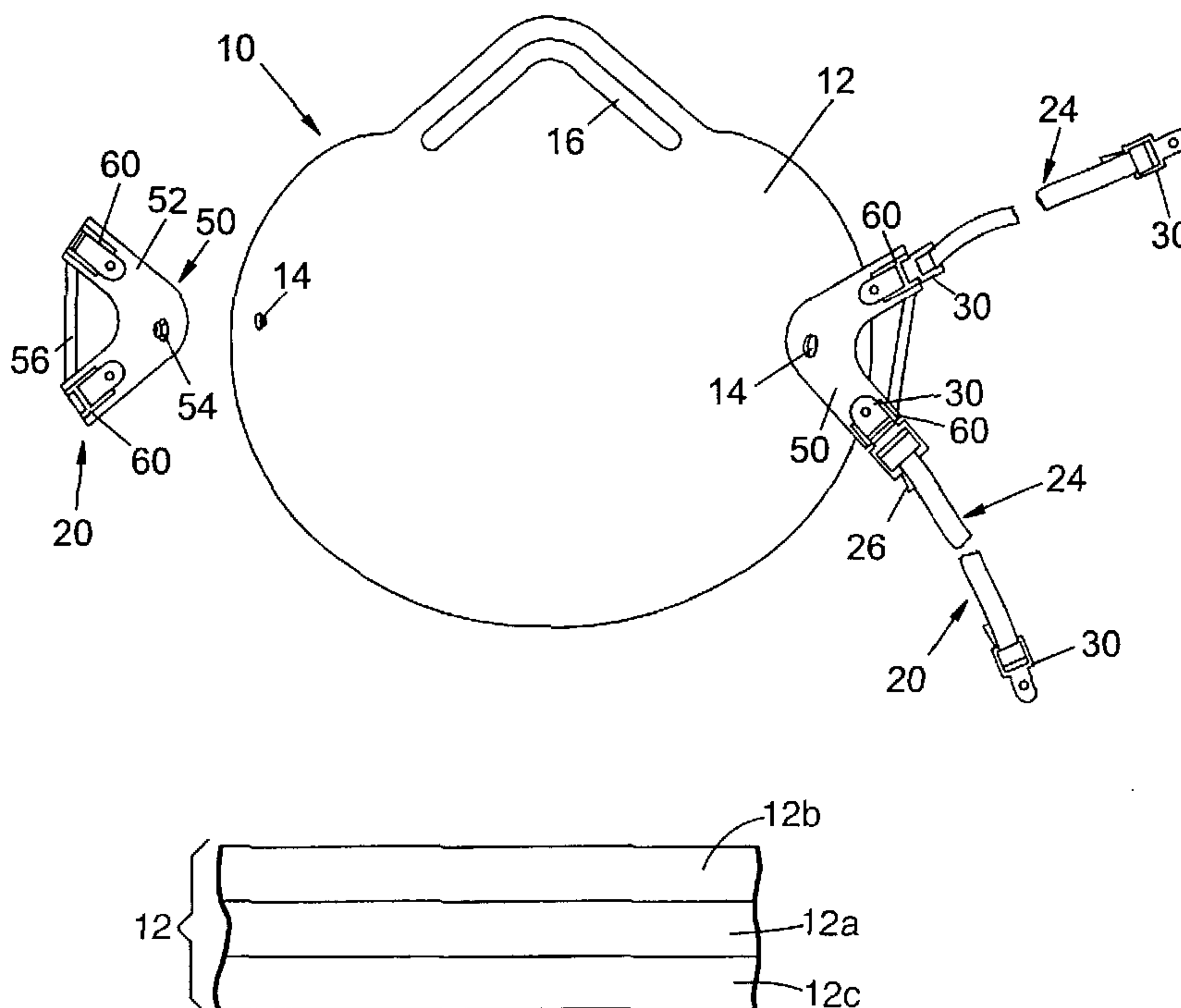




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(54) Titre : MASQUE FACIAL FILTRANT COMPRENANT DES ELEMENTS DE FIXATION POUR UN BANDEAU  
 (54) Title: FILTERING FACE MASK THAT HAS HEADBAND MOUNTS



**A**

(57) **Abrégé/Abstract:**

A face mask includes headband mounts fixedly attached to a porous filtering mask body for detachably connecting a headband assembly to a porous filtering mask body. The headband assemblies may be pivotally connected to the headband mounts and can include one or two straps. A packaged combination includes a plurality of face masks including headband mounts fixedly attached to a porous filtering mask body for detachably connecting a headband assembly to a porous filtering mask body. The package may also include one or more headband assemblies.

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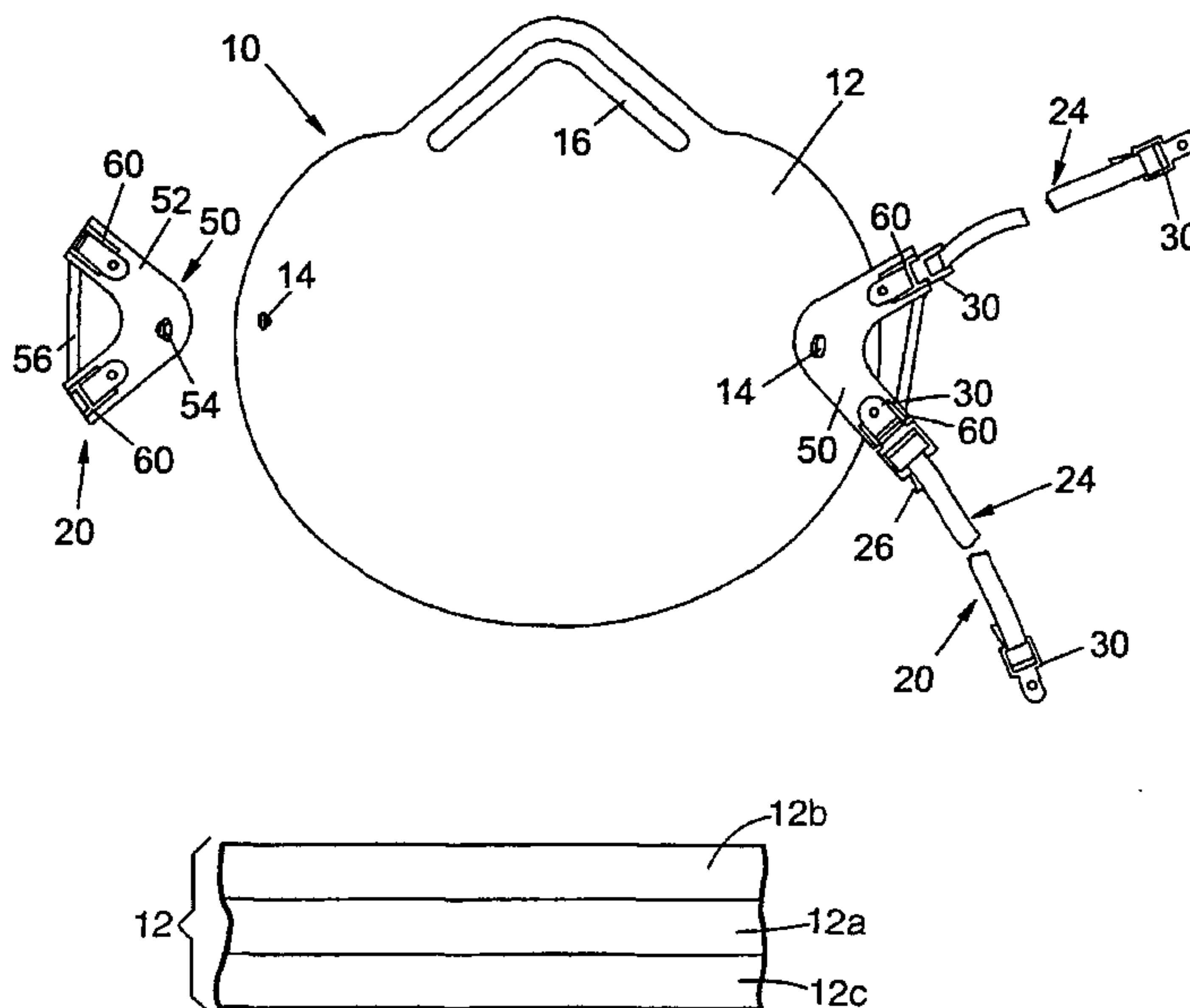
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(54) Title: FILTERING FACE MASK THAT HAS HEADBAND MOUNTS



A

(57) Abstract: A face mask includes headband mounts fixedly attached to a porous filtering mask body for detachably connecting a headband assembly to a porous filtering mask body. The headband assemblies may be pivotally connected to the headband mounts and can include one or two straps. A packaged combination includes a plurality of face masks including headband mounts fixedly attached to a porous filtering mask body for detachably connecting a headband assembly to a porous filtering mask body. The package may also include one or more headband assemblies.



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**FILTERING FACE MASK THAT HAS HEADBAND MOUNTS****Background**

This invention pertains to a filtering face mask that has filter media  
5 integral with the mask body and that can allow a variety of headband assemblies  
to be removably attached to the mask body.

Filtering face masks (also referred to in some instances as "respirators")  
are worn over the breathing passages of a person for two common purposes: (1)  
to prevent impurities or contaminants from entering the wearer's breathing track;  
10 and/or (2) to protect others from being exposed to pathogens and other  
contaminants exhaled by the wearer. In the first situation, the mask is worn in an  
environment where the air contains particles harmful to the wearer, for example,  
in an auto body shop. In the second situation, the mask is worn in an  
environment where there is a high risk of infection, for example, in an operating  
15 room.

Examples of filtering face masks are described in, e.g., U.S. Patent  
4,536,440 to Berg, 4,807,619 to Dyrud et al., 5,307,706 to Kronzer et al.,  
5,724,677 to Bryant et al., and D285,374 to Huber et al., as well as in  
International Publication No. WO 98/58558 by Angadjivand et al. Commercially  
20 available products include the 1800™, 1812™, 1838™, 1860™, and 8210™  
brand masks sold by the 3M Company.

To accomplish either of these purposes, the mask must be able to maintain  
a snug fit to the wearer's face. To achieve this fit, filtering face masks typically  
have a headband extending laterally from the mask around the back of the  
25 wearer's head and neck. The headbands usually include an elastic strap that  
adapts to a range of sizes. Some masks have a headband that uses a single strap  
while others use two straps.

Known headband attachments for a porous filtering face mask are  
permanent, such that removal of the headbands from the face mask body requires  
30 either destruction of the headbands, the face mask body, or both the headband  
and the face mask body. A drawback of permanent attachment is that when

either component, the headband or the face mask, reaches the end of its useful life, the entire assembly is discarded. For example, if a headband strap or straps break, or the filtering portion of the face mask becomes clogged with filtrate, the wearer discards the whole mask for a new one.

5 Another drawback is that, because the headbands are permanently attached to the face masks, the masks are supplied with either one or two straps. Due to differences in wearers' preferences and hair styles, however, some wearers may prefer a single strap while others may prefer dual straps extending around the back of the wearer's head and neck.

10 Improper tension from a single strap headband that is placed in a less-than-ideal location on a wearer's head (for comfort or other reasons) may exert forces that skew the mask from its intended wearing configuration. This can cause leaks around the mask perimeter, creating safety concerns and an incumbent decrease in utility. Similarly, leaks may also pose a concern if a  
15 headband including two straps is worn improperly.

Examples of face masks that accommodate two straps are shown, for example, in U.S. Patent No. 2,353,643 to Bulbulian, U.S. Patent No. 3,220,403 to Silverberg, U.S. Patent No. 5,191,882 to Vogliano, and U.S. Patent No. 5,086,768 to Niemeyer. Although these face masks and respirators accommodate  
20 two straps, the devices all require that both straps be attached to the mask body for proper positioning of the mask. None of the patents disclose a mask with a single strap or with a system that can accommodate either a single strap or double straps.

25

### Summary of the Invention

In view of the above, it can be seen then that a new and improved headband system for a filtering face mask is needed. Such a system should provide for detachably connecting a headband assembly to a face mask using headband assembly connectors that are fixedly attached to the filtering face mask.  
30 By providing such a system, manufacturers can supply the filtering face masks independently of the headband assemblies that are used to hold the face masks in

position on a wearer's head. After the filtering face mask has met its service life, the user can then detach the headband assembly from the face mask and re-use it with a new mask .

5 One advantage of this approach is the reduced cost that can be achieved by supplying the filtering face masks and headband assemblies independently. By providing the filtering face masks without headbands, the cost of including a headband assembly with each mask and the cost of attaching a headband assembly to each mask can be avoided.

10 Another advantage is that wearers may be able to reuse their own headbands, which may, in some instances, require little to no adjustment after removal from a spent porous filtering mask body and attachment to a fresh mask body. This may improve both the comfort and convenience of using the filtering face masks. By reusing headbands, it may also be possible to improve comfort by providing headband assemblies that are manufactured of more expensive materials  
15 that, due to cost constraints, could not be supplied with every face mask and disposed after a single use. Further, more consistent face filters may be provided.

In brief summary, the invention provides, in a first aspect, a filtering face mask that includes a porous filtering mask body. The mask body is adapted to fit over the nose and mouth of a person to filter air before it is inhaled by the person.  
20 The filtering face mask also includes headband mounts that are fixedly attached to opposing sides of the porous filtering mask body. The headband mounts are adapted to detachably connect to a headband assembly that can support the porous filtering mask body over the person's nose and mouth.

In a second aspect, the present invention provides a plurality of filtering  
25 face masks in a package. Each of the filtering face masks in the package includes a porous filtering mask body that is adapted to fit over the nose and mouth of a person to filter air before it is inhaled by the person. The filtering face masks also include headband mounts that are fixedly attached to opposing sides of the porous filtering mask body. The headband mounts adapted to detachably connect  
30 to a headband assembly that can support the porous filtering mask body over the person's nose and mouth. The package may be provided without any headband

assemblies, in other words, the package is free of any headband assemblies. In another aspect, the package may include at least one headband assembly. If provided, the headband assembly includes connectors adapted to connect to the headband mounts on one of the filtering face masks. The number of headband  
5 assemblies in the package is less than the number of filtering face masks in the package.

In a third aspect, the present invention provides a method of using a filtering face mask of the present invention. The method includes providing first and second filtering face masks, each of the face masks including a porous  
10 filtering mask body. The porous filtering mask bodies are adapted to fit over the nose and mouth of a person to filter air before it is inhaled by a wearer. The filtering face masks also include headband mounts that are fixedly attached to opposing sides of the porous filtering mask body. The headband mounts are adapted to detachably connect to a headband assembly that can support the  
15 porous filtering mask body on a wearer's face. The method of use also includes providing a headband assembly that includes connectors adapted to connect to the headband mounts on the porous filtering mask bodies. The connectors are attached to the headband mounts on the first filtering face mask and the mask with headband assembly are retained over the nose and mouth of a person. Air  
20 breathed by the person is filtered through the first filtering face mask. After use, the connectors on the headband assembly are detached from the headband mounts on the first filtering face mask and attached to the headband mounts on the second filtering face mask. The first filtering face mask may then optionally be discarded.

25 These and other features and advantages of the invention may be described in more detail below with respect to some illustrative embodiments of the invention.

### Glossary

30 As used in connection with the present invention, the following terms shall have the meanings provided below:

“detachably connect,” as applied to headband assemblies of the present invention, means that a headband assembly can be connected to and/or disconnected from a pair of headband mounts, which mounts are fixedly attached to a porous filtering mask body, without destruction of the headband assembly;

5 “porous filtering mask body” means a mask body that is permeable to air and that has filter media integral with the material that forms the mask body (for example, in the case of a molded face mask, the integral filter media may be provided in the shape of a molded shaping layer used to give the porous mask body a desired shape);

10 “fixedly attached,” as applied to components attached to a porous filtering mask body, means an any attachment technique in which separation of the attached components would basically require destruction of at least a portion of the porous filtering mask body or is likely to create a void or aperture in the porous filtering mask body through which unfiltered air could pass; and

15 “integral,” as applied to the filter media used in a porous filtering mask body of the present invention, means that the filter media is in the mask body as opposed to being in a cartridge housing.

#### **Brief Description of the Drawings**

20 Referring to the drawings, where like reference letters and numerals indicate corresponding structure throughout the several views:

FIG. 1 shows a front elevational view of a face mask **10** that has a headband assembly **20** that includes two straps, each strap mounted at one side of the mask according to the principles of the present invention;

25 FIG. 1A is an enlarged partial cross-sectional view of the mask body **12** illustrating the various layers in the mask body.

FIG. 2 shows a partially exploded perspective view of a portion of the mask **10** and headband assembly **20** shown in FIG. 1; and,

30 FIG. 3 shows a perspective view of an first strap connector **30** on a headband assembly to a face mask according to the principles of the present invention.

FIG. 4 is a perspective view of one alternative headband mount 114 according to the present invention.

FIG. 5 is a perspective view of another alternative headband mount 214 according to the present invention.

5 FIG. 6 is a diagram illustrating the combination of a plurality of face masks 310 and at least one headband assembly 320 in a package 380.

FIG. 7 is a diagram illustrating the combination of a plurality of face masks 410 in a package 480.

### 10 Detailed Description of Illustrative Embodiments of the Invention

The present invention provides systems for supporting filtering face masks over the nose and mouth of a person to filter air before it is inhaled. The filtering face masks include porous filtering mask bodies that may be either molded or provided in a flat mask configuration. Examples of some porous filtering mask  
15 bodies are described in, e.g., U.S. Patents 5,307,706 to Kronzer et al., 4,807,619 to Dyrud, 4,536,440 to Berg, 5,724,677 to Bryant et al., and D285,374 to Huber et al., as well as in International Publication No. WO 98/58558 by Angadjivand et al. Commercially available products include the 1800™, 1812™, 1838™, 1860™, and 8210™ brand masks sold by the 3M Company.

20 Regardless of the shape of the porous filtering mask bodies, they include filter media that is integral with the mask body. (as differentiated from masks or respirators including non-porous mask bodies and cartridges that contain the filter media, whether the cartridges are replaceable or not). It is preferred that the integral filter media cannot be separated from the porous filtering mask body  
25 without physically damaging the filter media. In many instances, the filter media is provided as a layer that is substantially coextensive with the porous filtering mask body. Because the filter media is integral with the mask body, the entire mask body is generally discarded when the filter media becomes clogged, contaminated, or otherwise reaches the end of its useful life.

30 In connection with the porous filtering mask bodies, the present invention also provides a variety of headband mounts fixedly attached to the porous



filtering mask bodies. The headband mounts are adapted to detachably connect headband assemblies to the porous filtering mask bodies. The headband mounts may be regarded as a headband connection system that suitably includes or consists essentially of the headband mounts, independent of any headband assembly. Although illustrative embodiments of some headband mounts are described below, many other mechanisms may be used in place of the illustrative  
5 closure materials for the headband mounts described below.

One advantage provided by some embodiments of the present invention is that the connection between the headband assembly and the porous filtering mask body may allow for pivoting or rotation at the point of attachment. That pivoting attachment may improve both the fit and comfort of the filtering face masks.  
10

Another advantage provided by some embodiments of the invention is the ability to attach either a single strap or double straps to the face mask at a single connection point to establish a good seal against the wearer's face. The system also may provide for utilizing an essentially identical strap for either the single strap configuration or utilizing two of the same straps in a double strap configuration. And the system may also allow interchangeable mounting of either the single strap or two straps to the mask. The present invention addresses these,  
15 as well as other shortfalls associated with known face mask headbands.  
20

In FIG. 1 there is shown a filtering face mask, generally designated 10, that includes a mask body 12 that has a nose clip 16 located on an upper portion of the mask body. The mask 10 is generally configured to follow the contour of the wearer's face, and the nose clip 16 is pliable to allow the mask to better adapt to the radical contour at the wearer's nose. The nose clip may have the configuration described in U.S. Patent 5,558,089 to Castiglione.  
25

When a wearer inhales, air is drawn through the filtering material that is integral to the mask body 12. The filtering material may include a fibrous non-woven filtering material 12a (FIG. 1A). Filtering materials that are commonplace on negative pressure half mask respirators like the respirator 10 shown in FIG. 1 contain an entangled web of electrically charged melt-blown  
30

microfibers (BMF). BMF fibers typically have an average fiber diameter of about 20 micrometers ( $\mu\text{m}$ ) or less, preferably about 2 to about 15  $\mu\text{m}$ . When randomly entangled in a web, they have sufficient integrity to be handled as a mat. Examples of fibrous materials that may be used as filters in a mask body are disclosed in U.S. Patent No. 5,706,804 to Baumann et al., U.S. Patent No. 4,419,993 to Peterson, U.S. Reissue Patent No. Re 28,102 to Mayhew, U.S. Patents 5,472,481; 5,411,576 to Jones et al.; and 5,908,598 to Rousseau et al.

The fibrous materials may contain additives to enhance filtration performance, such as the additives described in U.S. Patents 5,025,052 and 5,099,026 to Crater et al., and may also have low levels of extractable hydrocarbons to improve performance; see, for example, International Publication No. WO 99/16945 by Rousseau et al. Fibrous webs also may be fabricated to have increased oily mist resistance using the techniques described in U.S. Patent 4,874,399 to Reed et al., and in International Publication Nos. WO 99/16532 and WO 99/16533, both by Rousseau et al. Electric charge can be imparted to nonwoven BMF fibrous webs using techniques described in, for example, U.S. Patent 5,496,507 to Angadjivand et al., U.S. Patent 4,215,682 to Kubik et al., and U.S. Patent 4,592,815 to Nakao.

FIG. 1A illustrates an enlarged cross-section of a portion of the mask body 12 which includes a filter layer 12a, an outer cover web 12b, and an inner shaping layer 12c. The filter layer 12a is integral with the mask body 12. That is, it forms part of the mask body 12 and is not a part that subsequently becomes attached to the body. The cover web 12b may protect the filter layer 12a from abrasive forces and may also retain any fibers that may come loose from the filter layer 12a. The cover web 12b may also have filtering abilities, although typically not nearly as good as the filtering layer 12a. The cover web may be made, e.g., from nonwoven fibrous materials containing polyolefins and polyesters (see, e.g., U.S. Patents 4,807,619 and 4,536,440, as well as International Publication No. WO 98/58558 by Angadjivand et al.).

Shaping layer 12c provides structure to the mask body 12 and support for filter layer 12a. Although the shaping layer 12c is located on the inside of the

mask body 12, it may be located on either side of the filter layer 12a (or on both sides of filter layer 12a). The shaping layer 12c can be made, for example, from a nonwoven web of thermally-bondable fibers molded into a cup-shaped configuration. The shaping layer can be molded in accordance with known  
5 procedures (see, e.g., U.S. Patent No. 5,307,796 to Kronzer et al.). The shaping layer or layers typically are made of bicomponent fibers that have a core of a high melting material, such as polyethylene terephthalate, surrounded by a sheath of lower melting material so that when heated in a mold, the shaping layer conforms to the shape of the mold and retains this shape when cooled to room temperature.  
10 When pressed together with another layer, such as the filter layer, the low melting sheath material can also serve to bond the layers together.

Filtering face masks of the invention may also include a thermochromic fit indicating seal at its periphery to allow the wearer to easily ascertain if a proper fit has been established – see U.S. Patent 5,617,849 to Springett et al. The face  
15 masks may also include additional layers, valves (see, e.g., U.S. Patent No. 5,509,436), etc.

Headband mounts are fixedly attached to opposing sides of the mask body 12. In the embodiment illustrated in FIGS. 1-3, the headband mounts are shown in the form of mounting studs 14 that extend outward from the surface of the  
20 mask body 12. The mounting studs 14 may include a cylindrical portion with an upper widened end.

The headband mounts may be attached to the porous filtering mask body 12 by any suitable technique including, but not limited to adhesives, welding, mechanical engagement, molding, etc. The attachment technique preferably does  
25 not require perforation of the filter media in the porous filtering mask body 12. The headband mounts may be fixedly attached to the porous filtering mask body 12 such that their removal requires destruction of at least a portion of the porous filtering mask body 12 or would result in a void or aperture in the porous filtering mask body 12 through which unfiltered air could pass.

30 The mask body 12 attaches to a headband assembly, generally designated 20. As shown in both FIGS. 1 and 2, two straps 24 may be utilized to retain the

mask 10 on the wearer. Straps 24 may be attached to a first strap connector 30 that is capable of attaching to a second strap connector 50. Or, as shown in FIG. 3, the headband assembly 20 may take on a different configuration where a single strap 22 is used in the headband assembly such that connector 30 attaches the  
5 strap 22 to the mounting stud 14 on the mask body 12 rather than to a second strap connector 50.

Referring again to FIG. 1, the second strap connector 50 mounts to the mask body 12 on the mounting studs 14. The orifice 54 is sized so that it fits onto the mounting stud 14 with an interference fit over the widened end portion  
10 of the mounting stud 14 similar to the direct mounting of the first strap connector 30. Once the stud member 14 has been inserted through the orifice 54, the widened end portion retains the base 52 against the mask body 12. With this configuration, the base 52 is free to rotate about the stud 14, and the second strap connector 50 is pivotally mounted to the mask body 12.

When the mask 10 uses only a single strap 22 as shown in FIG. 3, the  
15 strap extends between two of the first strap connectors 30, one connecting to each end 26 of the strap 22. The first strap connector 30 includes a tongue portion 32 having a rounded end and an orifice 34 (FIG. 2) formed therethrough. Each first strap connector 30 includes a strap receiving portion 36 that has a  
20 gripping member 38. The gripping member includes a hinge 40, shown as a living hinge in the preferred embodiment for reduced cost and ease of manufacture, and a leading serrated edge 42. The gripping member 38 pivots between an open position, shown in FIG. 3, for inserting the end 26 of the strap and a closed position, shown in FIG. 1 where the strap 22 is firmly retained. When the  
25 gripping member 38 is closed, following insertion of strap 26 end through the receiving portion 36, the serrated leading edge 42 engages the strap 22 and secures the first strap connector 30 to the strap 22 at the selected position.

This adjustable retaining system allows the length of the strap 22 to vary to a size that fits most comfortably around the neck and head of the wearer. As  
30 explained below, dual straps 24 also connect to the same first strap connectors 30.

The first strap connectors 30 easily attach to the mask body 12 by inserting them onto the mounting studs 14. The stud 14 inserts through the orifice 34 (FIG. 2) formed in the tongue 32. The widened end portion of the stud 14 has a slight interference fit with the orifice 34 to enable the stud member 14 to be forced through the orifice 34 so that the first strap connectors 30 snap onto the studs 14. Once inserted, however, the widened end portion of the stud member 14 retains the tongue 32 against the mask body 12. When the first strap connector 30 has been attached to the mask body 12, the connector 30 rotates about the stud 14, and a pivotal connection is formed between the stud member 14 and the first strap connector 30. This configuration provides greater flexibility in adapting the mask to the shape and size of the wearer's head to achieve a more comfortable fit.

In FIG. 2, there is shown an embodiment of the headband configuration 20 for the mask 10 which uses a double band assembly. When double straps 24 are used around the back of the head and neck of the wearer, a second strap connector 50 is utilized. The second strap connector 50 includes a base 52 that has an orifice 54 formed in the base. The base 52 includes two strap receiving portions 60 extending at substantially right angles to one another with a brace 56 extending therebetween. The strap receiving portions 60 are configured for receiving the first strap connectors 30 and forming a harness assembly connecting to double straps 24. Although this embodiment uses two straps 24 or a double band harness, a single one of the straps 24 may be mounted as shown in FIG. 3, for use as a single strap 22 in a single band harness assembly. Therefore, the interchangeability of the straps 24 and 22 having the same first strap connectors 30 provides for a more adaptable mask retaining system.

Each of the strap receiving portions 60 includes a retaining pin 62 extending upward from the base. The pin 62 includes a slanted face portion 64 angled toward an insertion end of the strap receiving portion 60 to allow connector tongue 32 to be easily and readily secured to receiving portion 60. Near the outward end of the strap receiving portion 60, a retainer 66 forms a space for receiving the tongue 32 of the first strap connectors 30. The retainer

66 includes sides 68 and a recessed base 70. A cross member 72 is spaced apart from the recessed base 70 and is configured for sliding the tongue 32 into the strap receiving portion 60. When inserted, the tongue 32 extends under the cross member 72 and over the recessed base 70. The tongue 32 is flexible enough to bend upward and slide over the angled face 64 of the pin 62 until the retaining pin 62 is in registration with the orifice 34. The resiliency of the flexing tongue 32 springs the tongue 32 back to a substantially planar position with the pin 62 extending through the orifice 34. The pin 62 and the cross member 72 cooperate to retain the first strap connector 30 in the second strap connector 50. The substantially right angled diverging configuration of the two strap receiving portions 60 provides for spacing the ends of the double straps 24 apart from one another for a more stable and comfortable fit for the wearer.

Using the invention, identical straps 22 may be employed with either a double or single headband system 20. The mask body 12 does not need to be modified for receiving either a single or double strap. The present invention also provides for a headband 20 that pivotally mounts to the mask body 12 with either a single or double strap configuration.

As another alternative, it may also be possible to thread a strap through the opening formed by the brace 56 and the two strap receiving portions 60 to provide a headband assembly that allows for a dropdown mask and headband combination.

FIG. 4 illustrates an alternative headband mount that is fixedly attached to the porous filtering mask body 112. The headband mount depicted in FIG. 4 is in the form of a pin receiver 114 fixedly attached to the porous filtering mask body 112 in place of the mounting studs 14 on body 12. The receiver 114 includes a void 115 to which a headband assembly can be detachably connected. The receiver 114 may preferably be mounted for rotation about an axis 113 that extends generally perpendicularly through the porous filtering mask body 112 in the area where the receiver 114 is attached to the body 112. That rotation may improve the fit and/or comfort of the mask when in place on a person's head with a headband assembly.

FIG. 5 illustrates another alternative headband mount that is fixedly attached to a porous filtering mask body **212**. The headband mount depicted in FIG. 5 is in the form of a receiver **214** including a keyhole-shaped void **215**. The void **215** includes a neck portion **215a** and a central portion **215b**. It is preferred that the width ( $w$ ) of the neck portion **215a** be less than the diameter of the central portion **215b** (which, in the preferred embodiment is generally circular).

The receiver **214** is adapted for connection to a stud **270** that would be attached to the headband assembly at, for example, the first strap connector **30** or the second strap connector **50** (see, e.g., FIGS. 1-3). The stud **270** includes a shaft **272** and an enlarged end **274**. The diameter of the shaft is preferably at least slightly larger than the width of the neck portion **215a** of the void **215** and equal to or less than the diameter of the central portion **215b** of the void **215**. As a result, upon insertion of the stud **270** into the void **215**, the stud **270** is retained within the central portion **215b** of the void **215**. When properly sized, the stud **270** can rotate about its longitudinal axis **276**, which may improve the fit and/or comfort of the mask when in place on a person's head with a headband assembly.

FIG. 6 illustrates a package **380** that includes a plurality of filtering face masks **310** according to the present invention (with headband mounts fixedly attached to a porous filtering mask body). The package also includes at least one headband assembly adapted to be detachably connected to the filtering face masks **310** in the package **380**. In the illustrated combination, the package **380** includes two headband assemblies **320**. In some instances, it may be preferred to provide at least one of the headband assemblies **320** with a single strap and at least one of the headband assemblies **320** with two straps. By doing so, users may select the headband assembly **320** that is most comfortable for them.

Although the package **380** may contain a plurality of headband assemblies **320**, the number of headband assemblies **320** is preferably less than the number of filtering face masks **310**. As a result, cost savings can be achieved by providing a headband assembly **320** that can be reused with two or more of the filtering face masks **310**.

Another alternative is illustrated in FIG. 7 where a package 480 includes a plurality of filtering face masks 410 according to the present invention. The package 480 does not contain any headband assemblies, i.e., the package 480 is free of any headband assemblies (which can be obtained separately from the  
5 filtering face masks 410).

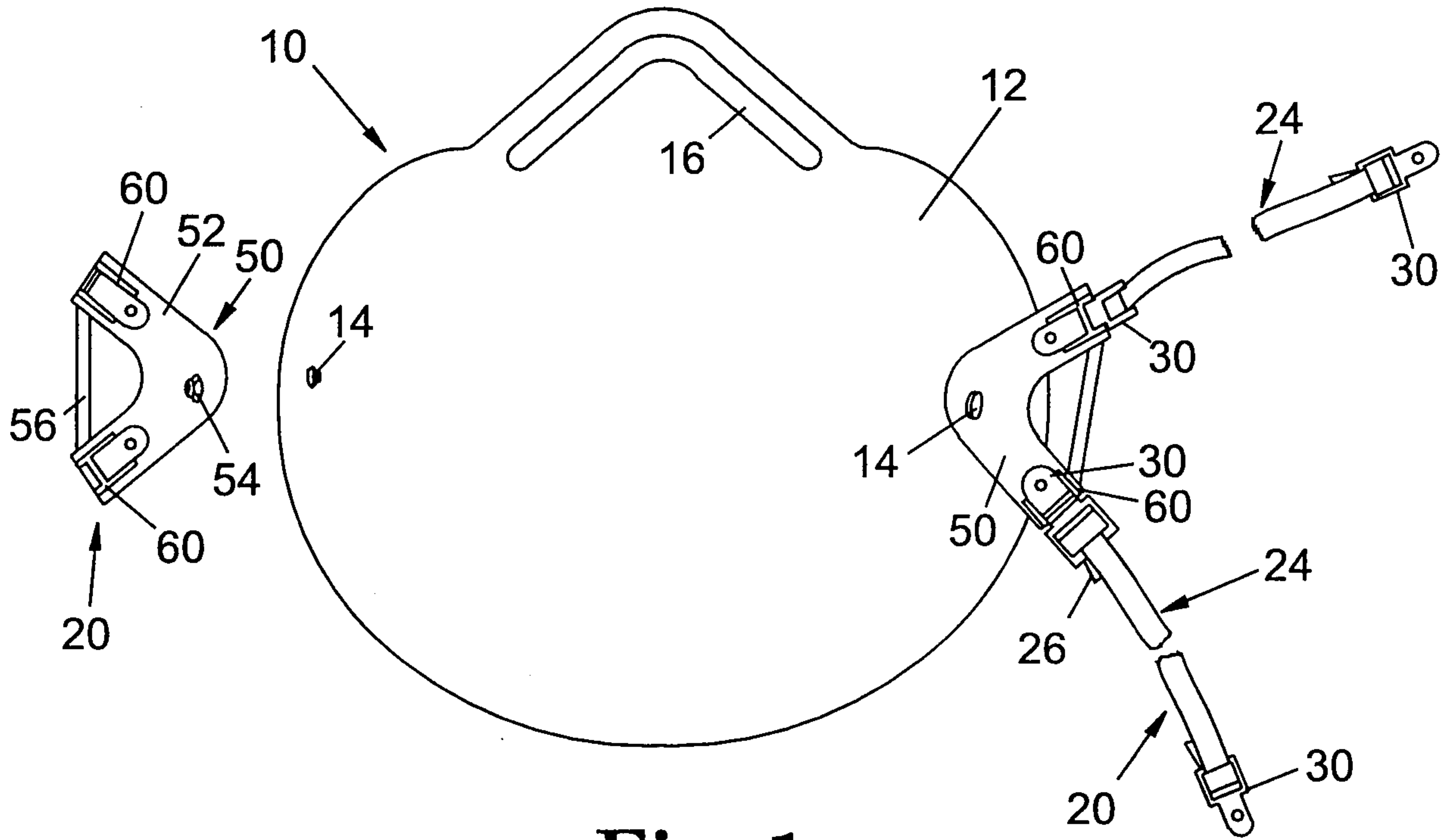
Although numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and that changes may be made in detail, especially in matters of shape, size and  
10 arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.



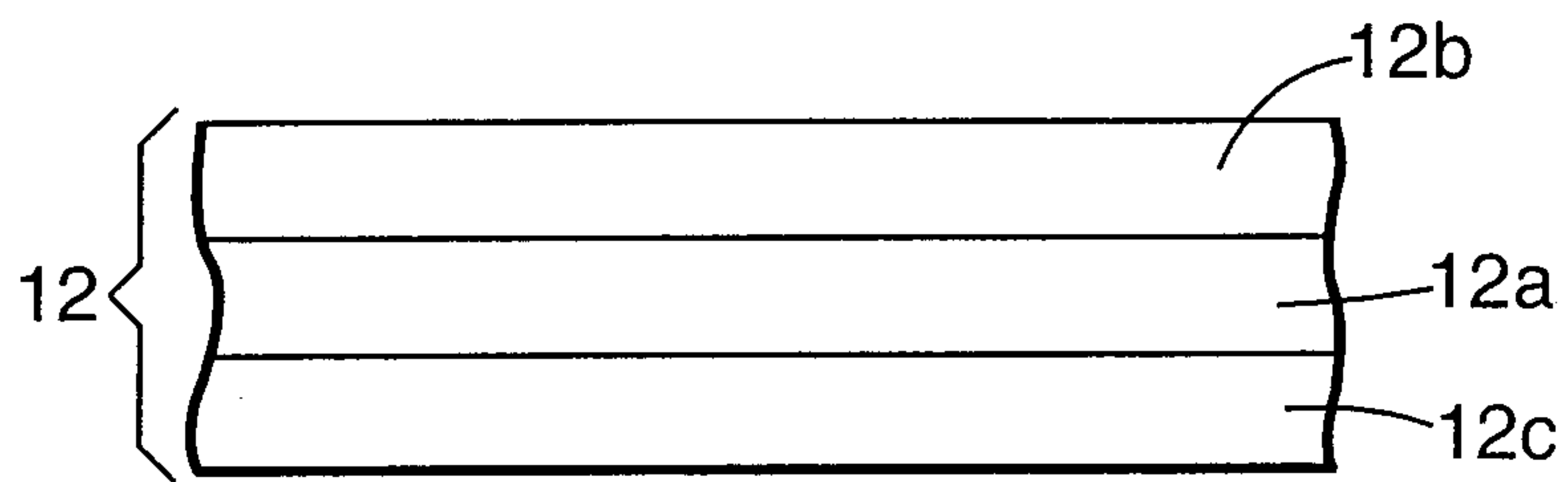
## Claims:

1. A filtering face mask that comprises:  
a porous filtering mask body that is adapted to fit over the nose  
5 and mouth of a person to filter air before it is inhaled by the person; and  
headband mounts that are fixedly attached to opposing sides of the  
porous filtering mask body, the headband mounts being adapted to detachably  
connect to a headband assembly that can support the porous filtering mask body  
over the person's nose and mouth.  
10
2. The filtering face mask of claim 1, wherein each of the headband mounts  
comprises a stud.
3. The filtering face mask of claims 1-2, wherein the porous filtering mask  
15 body comprises a nose brace that is pliable to adapt the mask body to a person's  
nose.
4. The filtering face mask of claims 1-2, wherein the porous filtering mask  
body comprises a molded body that includes a nonwoven fibrous web.  
20
5. The filtering face mask of claims 1-2, further comprising a headband  
assembly comprising connectors detachably connected to the headband mounts.
6. The filtering face mask of claim 5, wherein the connectors are pivotally  
25 connected to the headband mounts.
7. The filtering face mask of claim 5, wherein the headband assembly  
includes only a single strap.
- 30 8. The filtering face mask of claim 5, wherein the headband assembly  
comprises two straps.

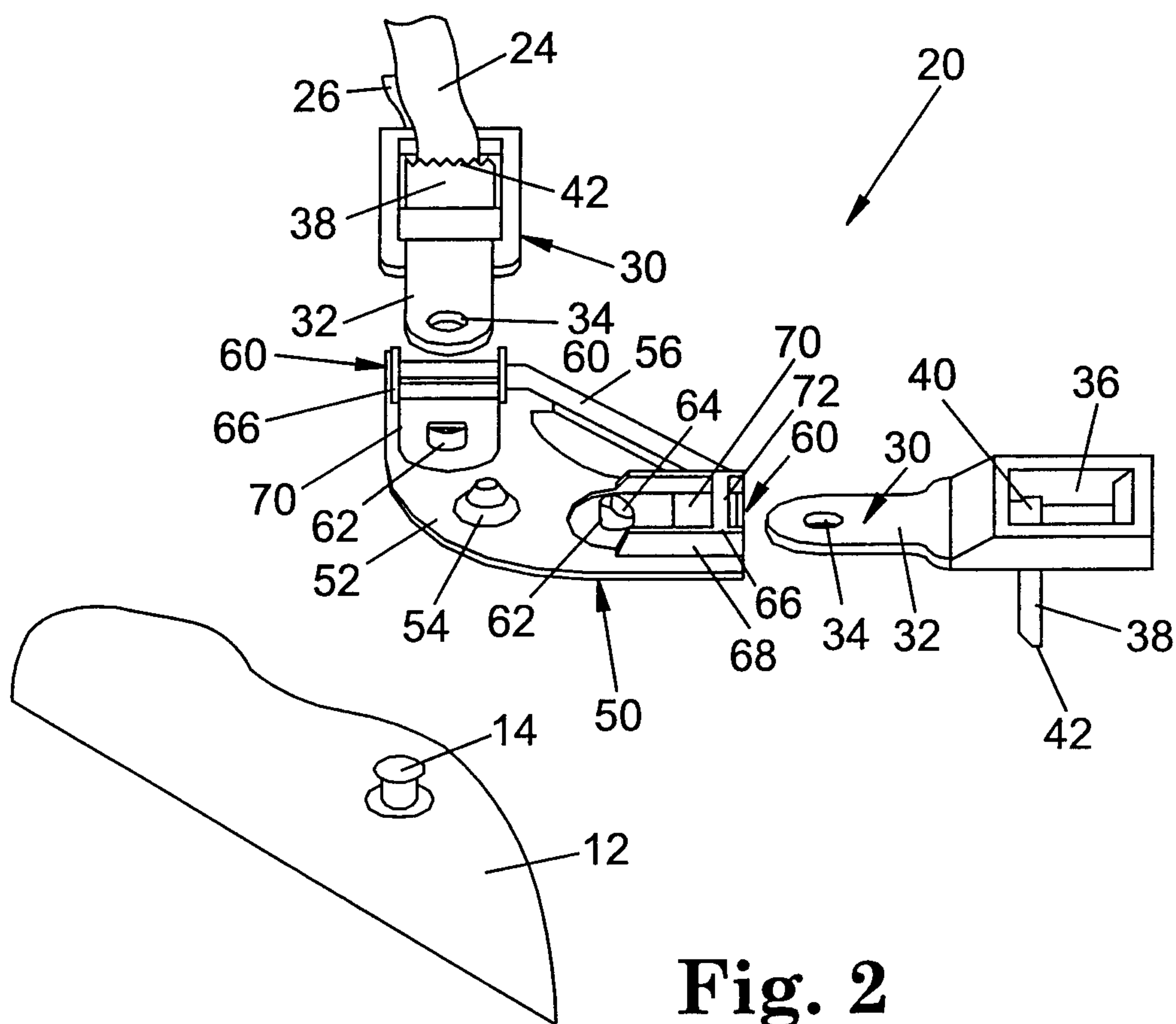
9. A combination that comprises:  
a package; and  
a plurality of the filtering face masks of claims 1-2 in the package.
- 5
10. The combination of claim 9, wherein the package further comprises at least one headband assembly enclosed in the package, the headband assembly comprising connectors adapted to connect to the headband mounts on the filtering face masks, wherein the number of headband assemblies in the package is  
10 less than the number of filtering face masks in the package.
11. The combination of claim 10, wherein at least two headband assemblies are located in the package, and further wherein at least one of the headband assemblies includes only a single strap and at least one of the headband assemblies  
15 comprises two straps.
12. A method of using a filtering face mask that comprises:  
providing first and second filtering face masks , each of the face masks comprising the filtering face mask of claim 1;  
20 providing a headband assembly that comprises connectors adapted to connect to the headband mounts on the porous filtering mask bodies;  
attaching the connectors on the headband assembly to the headband mounts on the first filtering face mask;  
retaining the first filtering face mask over the nose and mouth of a person  
25 using the headband assembly;  
filtering air breathed by the person through the first filtering face mask;  
detaching the connectors on the headband assembly from the headband mounts on the first filtering face mask; and  
attaching the connectors on the headband assembly to the headband  
30 mounts on the second filtering face mask.



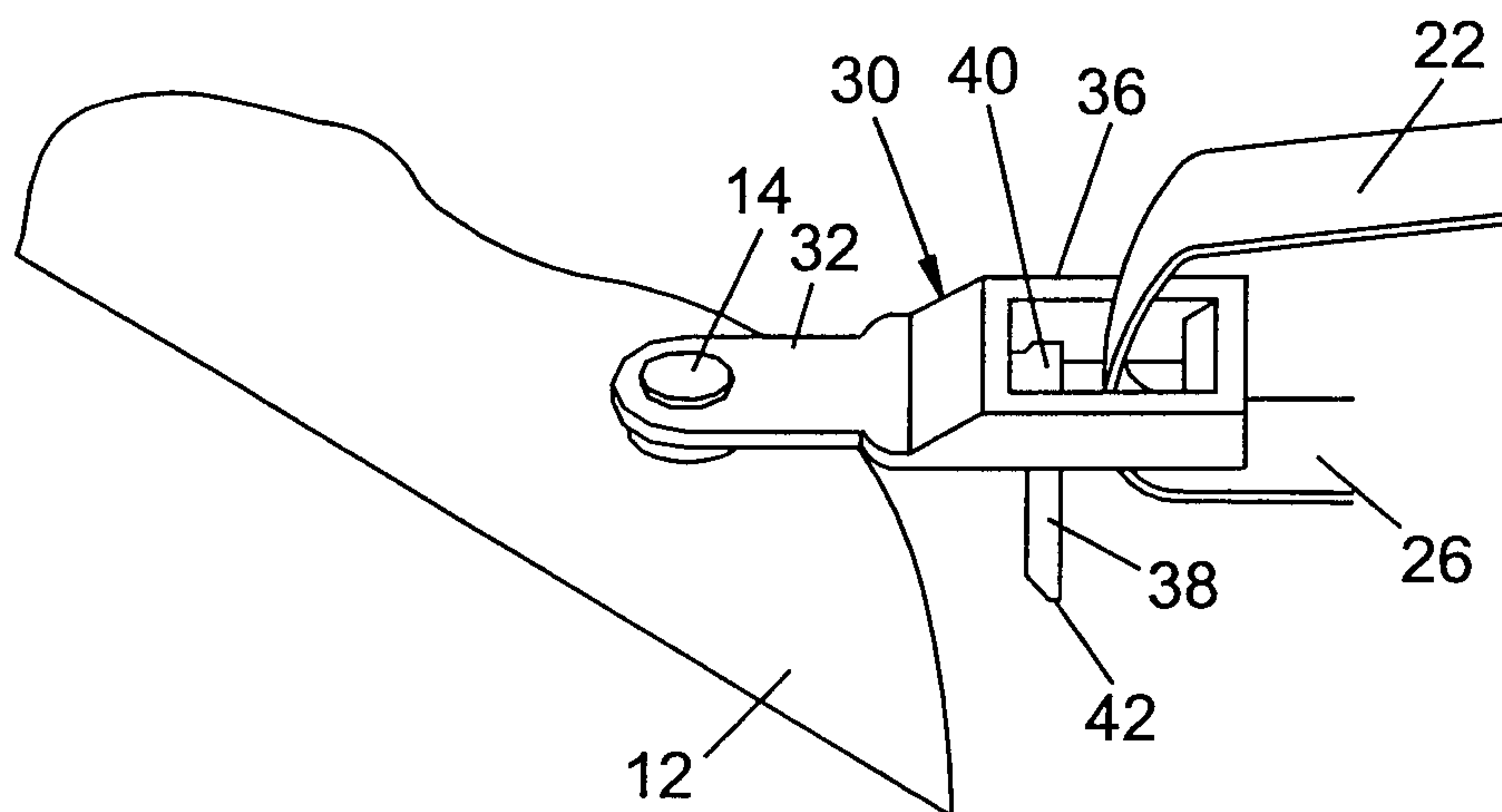
**Fig. 1**



**Fig. 1A**

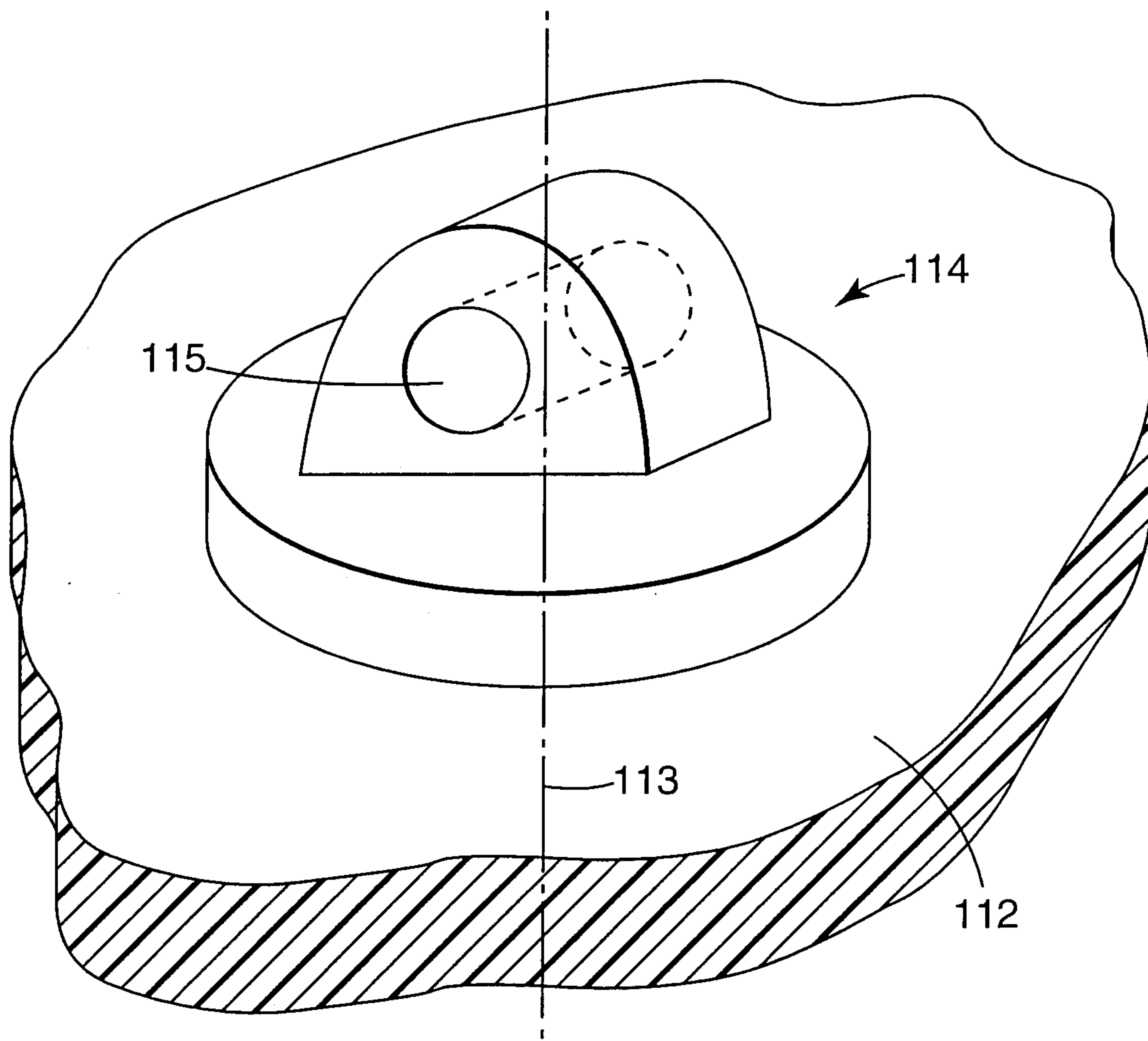


**Fig. 2**

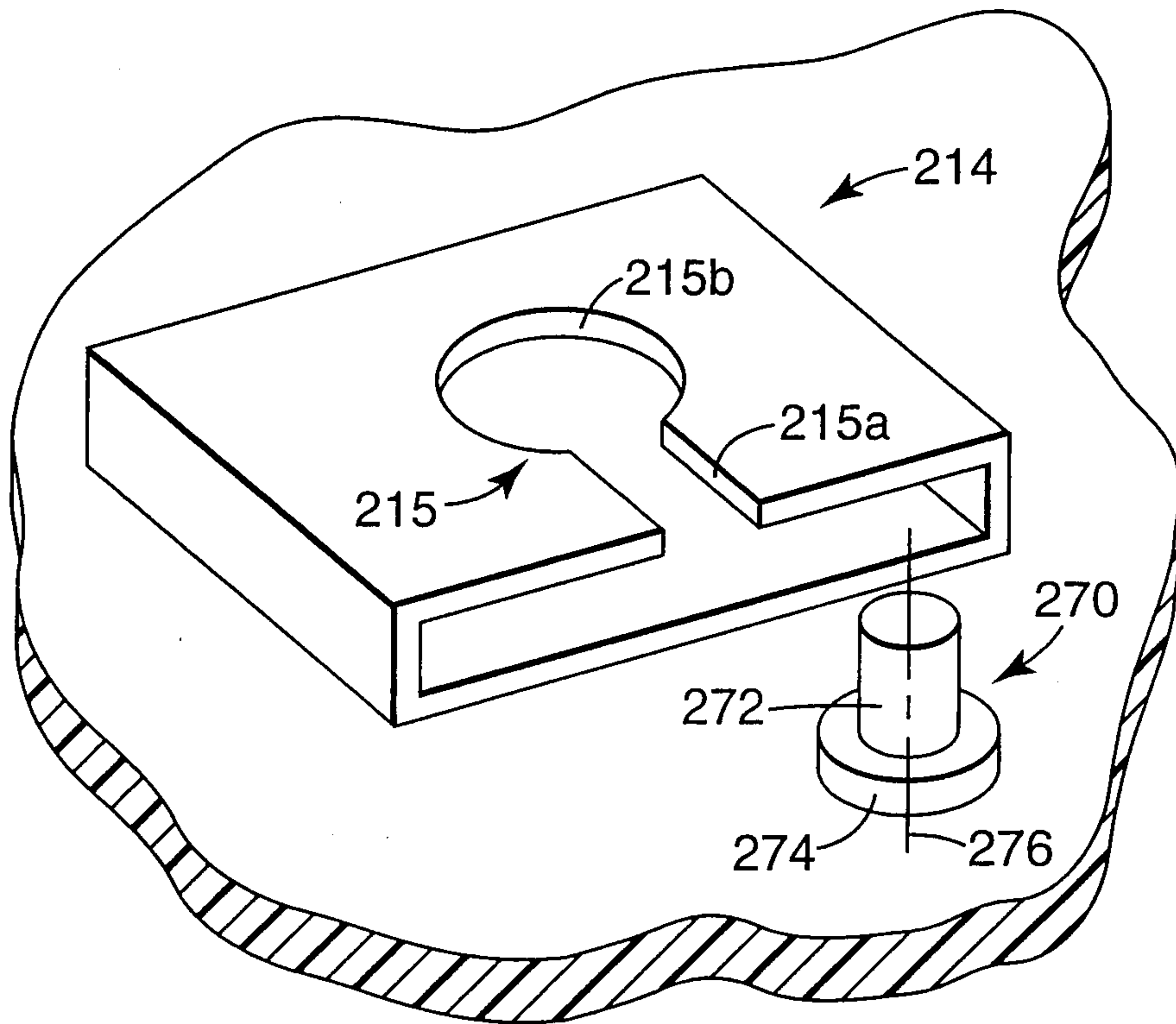


**Fig. 3**

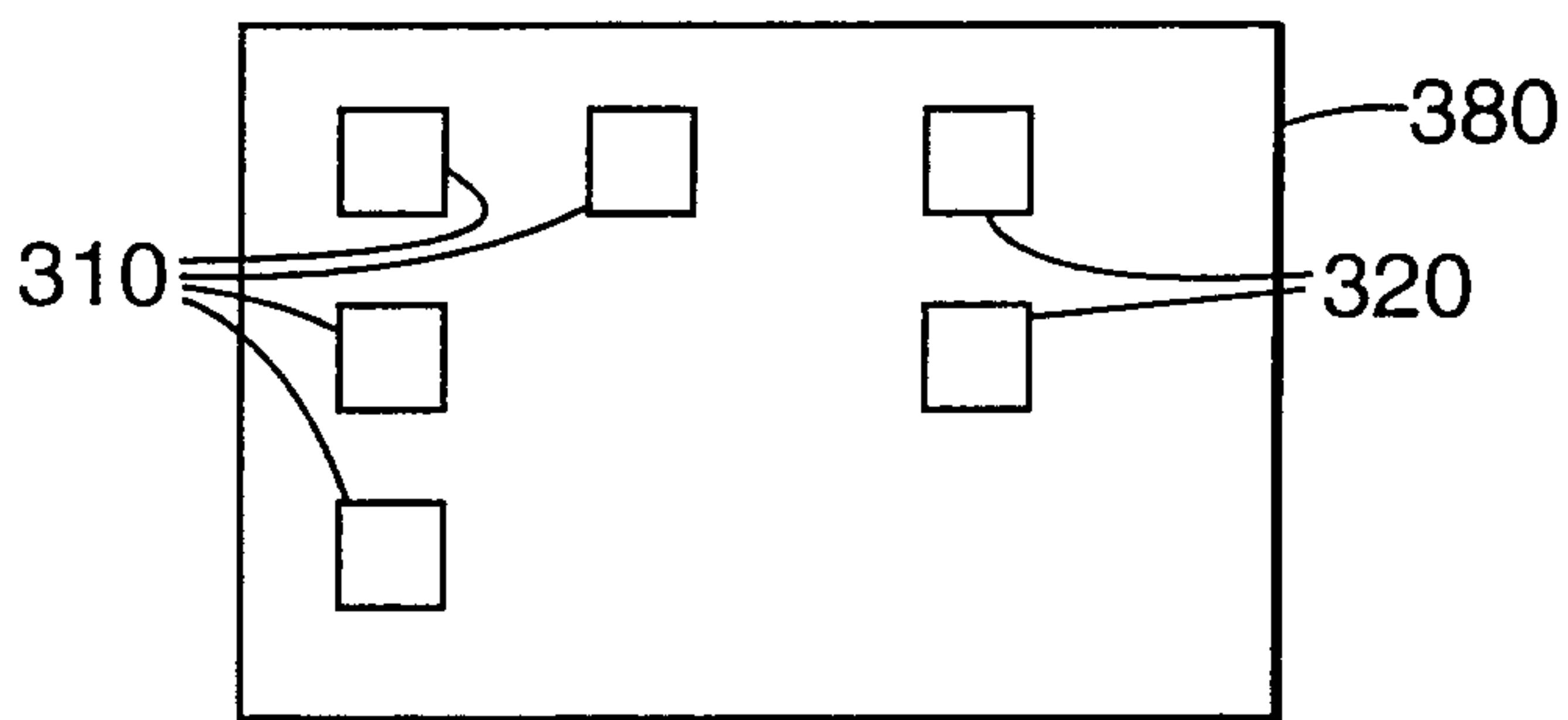
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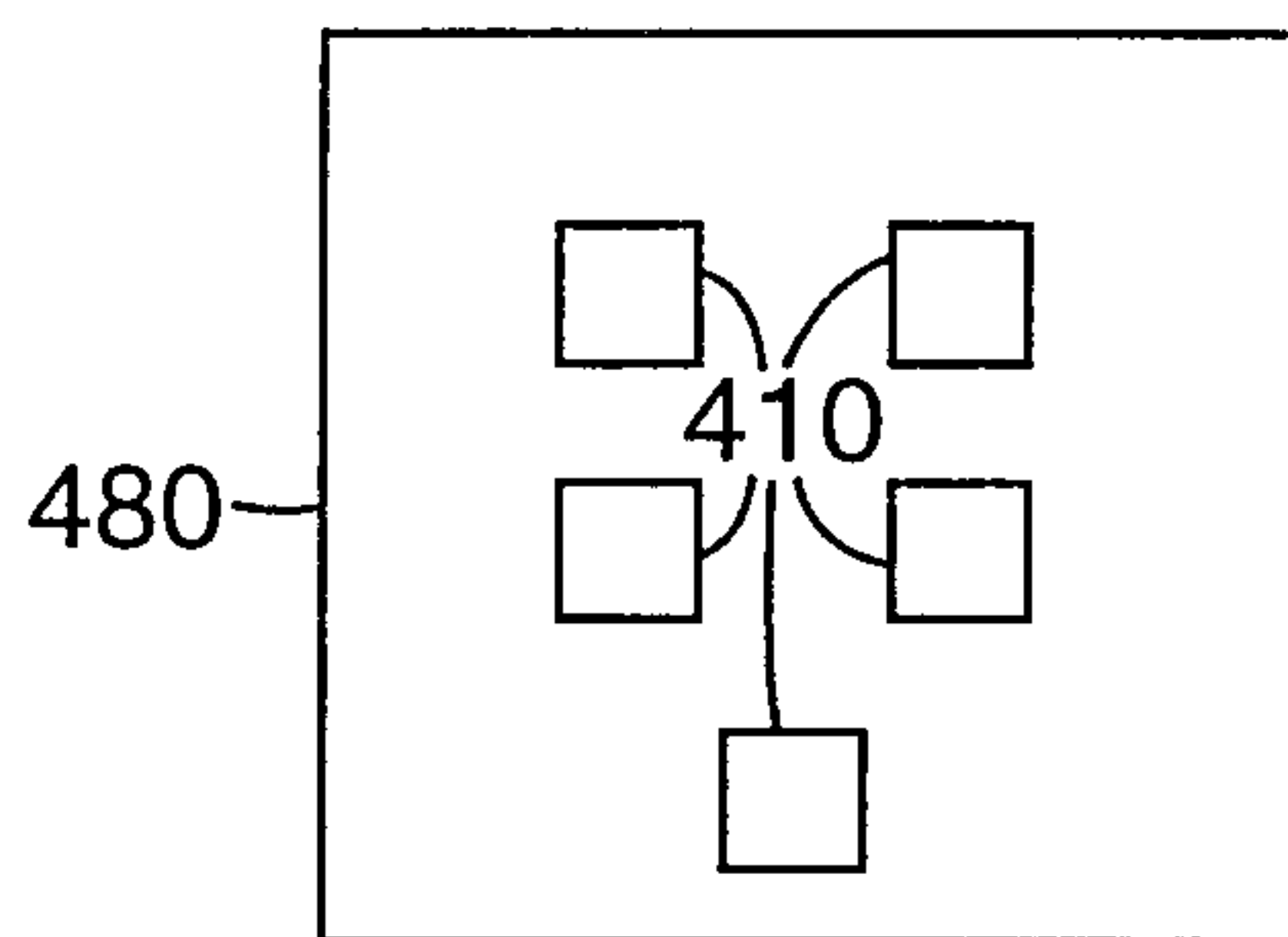
**Fig. 4**



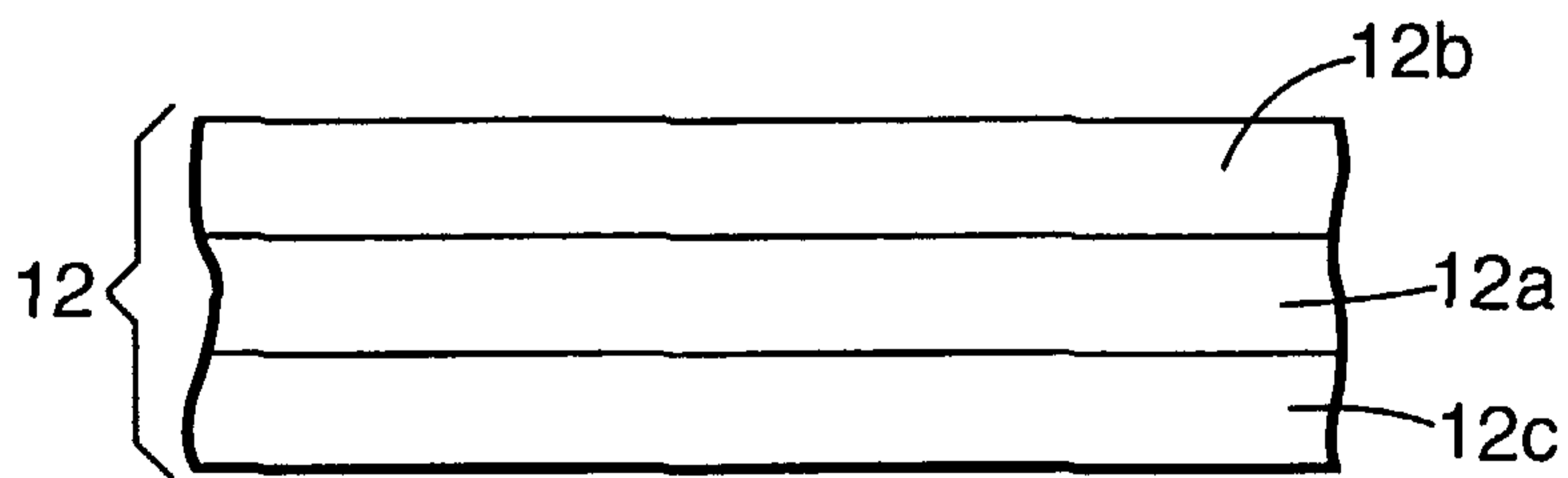
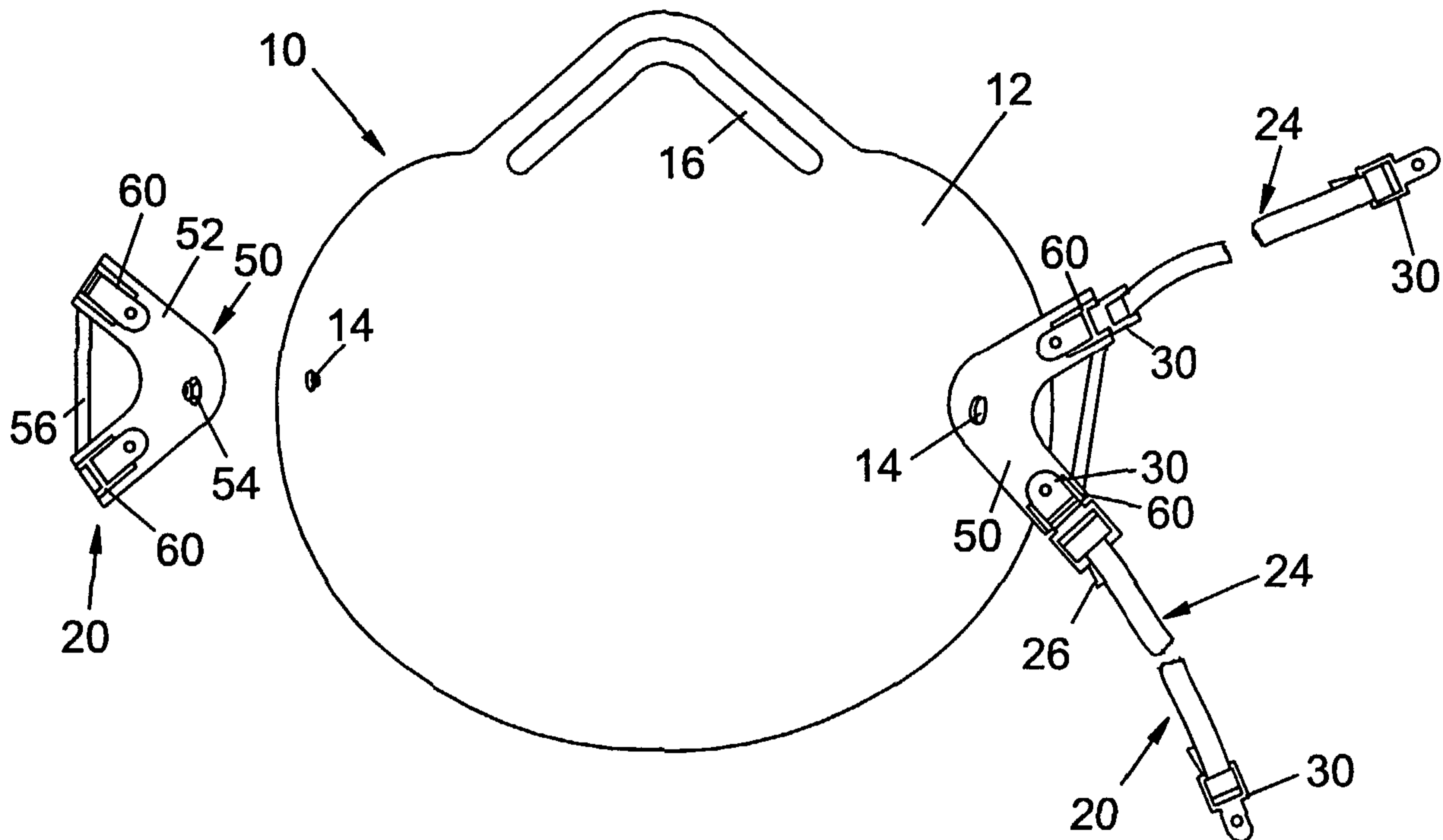
**Fig. 5**



**Fig. 6**



**Fig. 7**



**A**