US007483544B2

(12) **United States Patent**
Wright et al.

(10) **Patent No.: US 7,483,544 B2**
(45) **Date of Patent: Jan. 27, 2009**

(54) **AUDIO DEVICE POST EXTENSION AND ANGLING SYSTEM**

(76) Inventors: **Doug S. Wright**, 3554 Quincy Ave., Simi Valley, CA (US) 93063; **Vance Dickason**, 4330 Imperial Dr., West Linn, OR (US) 97068

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 526 days.

(21) Appl. No.: **11/040,949**

(22) Filed: **Jan. 21, 2005**

(65) **Prior Publication Data**

US 2005/0123156 A1 Jun. 9, 2005

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/885,861, filed on Jul. 7, 2004, now Pat. No. 7,121,756.

(60) Provisional application No. 60/497,752, filed on Aug. 26, 2003.

(51) **Int. Cl.**
H04R 1/02 (2006.01)

(52) **U.S. Cl.** **381/336**; 381/332

(58) **Field of Classification Search** 381/87, 381/150, 182, 332, 334, 335, 386; 181/144, 181/145, 146

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,002,780	A *	12/1999	Espiritu	381/182
6,006,399	A *	12/1999	Massaro	15/315
6,101,262	A *	8/2000	Haase et al.	381/386
6,282,297	B1 *	8/2001	Lin	381/386

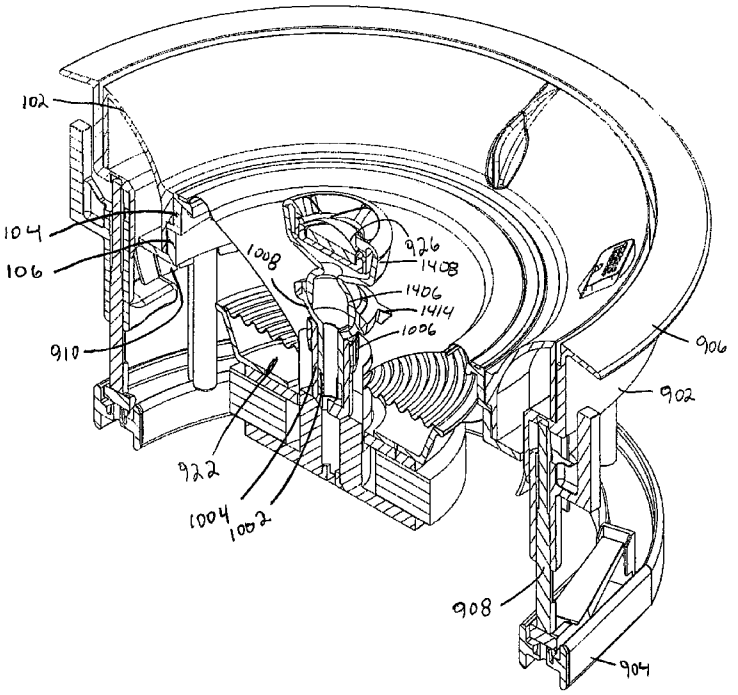
* cited by examiner

Primary Examiner—Brian Ensey
(74) *Attorney, Agent, or Firm*—Loza & Loza, LLP; Julio M. Loza

(57) **ABSTRACT**

One embodiment of the invention provides a post extension system frame assembly for mounting fixtures within a recess in a wall or ceiling and that can be adjusted and installed with minimal time and effort. One feature of the invention provides a post extension mechanism that can be manually installed and/or adjusted to position a first audio device either above or below the mounting surface and an angling mechanism permits adjusting the direction and angle of the audio device to permit positioning the sound dispersion axis of the audio device (e.g., speaker, tweeter, woofer, audio transducer, etc.) directly towards a listener. Another feature of the invention provides a rotating angling mechanism that permits adjusting the sound dispersion axis of a recessed second audio device.

21 Claims, 25 Drawing Sheets



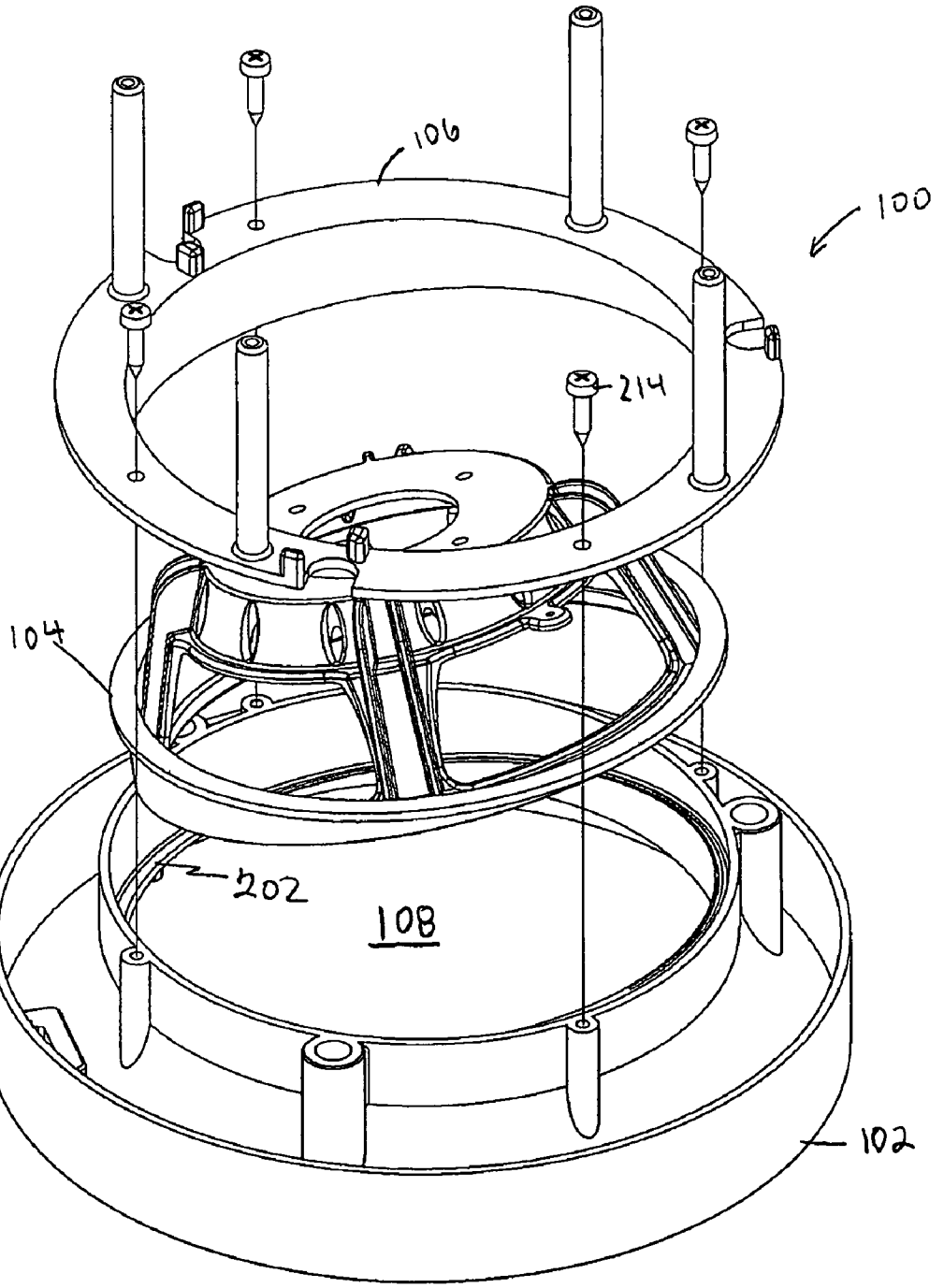


Figure 1

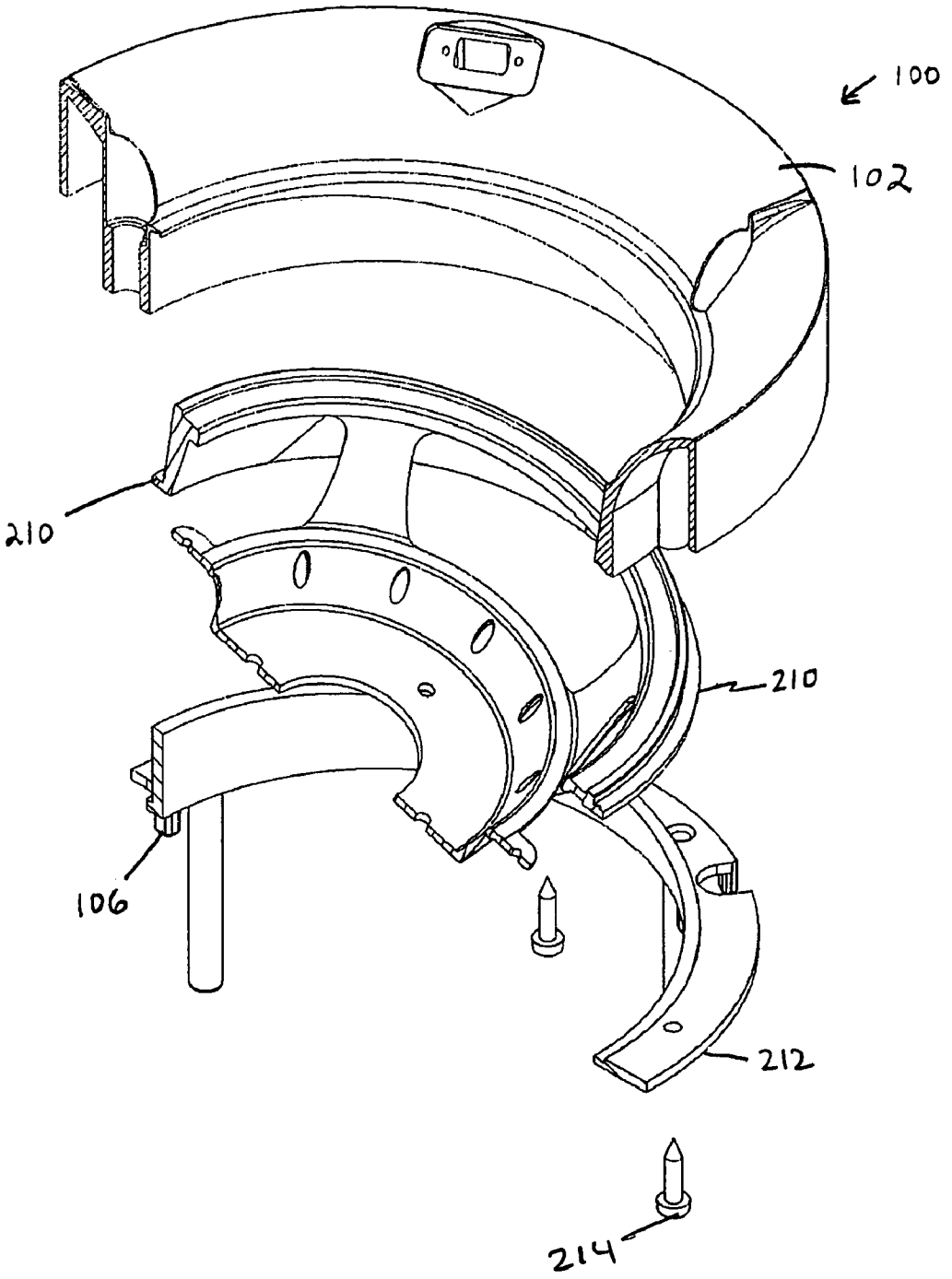


Figure 2

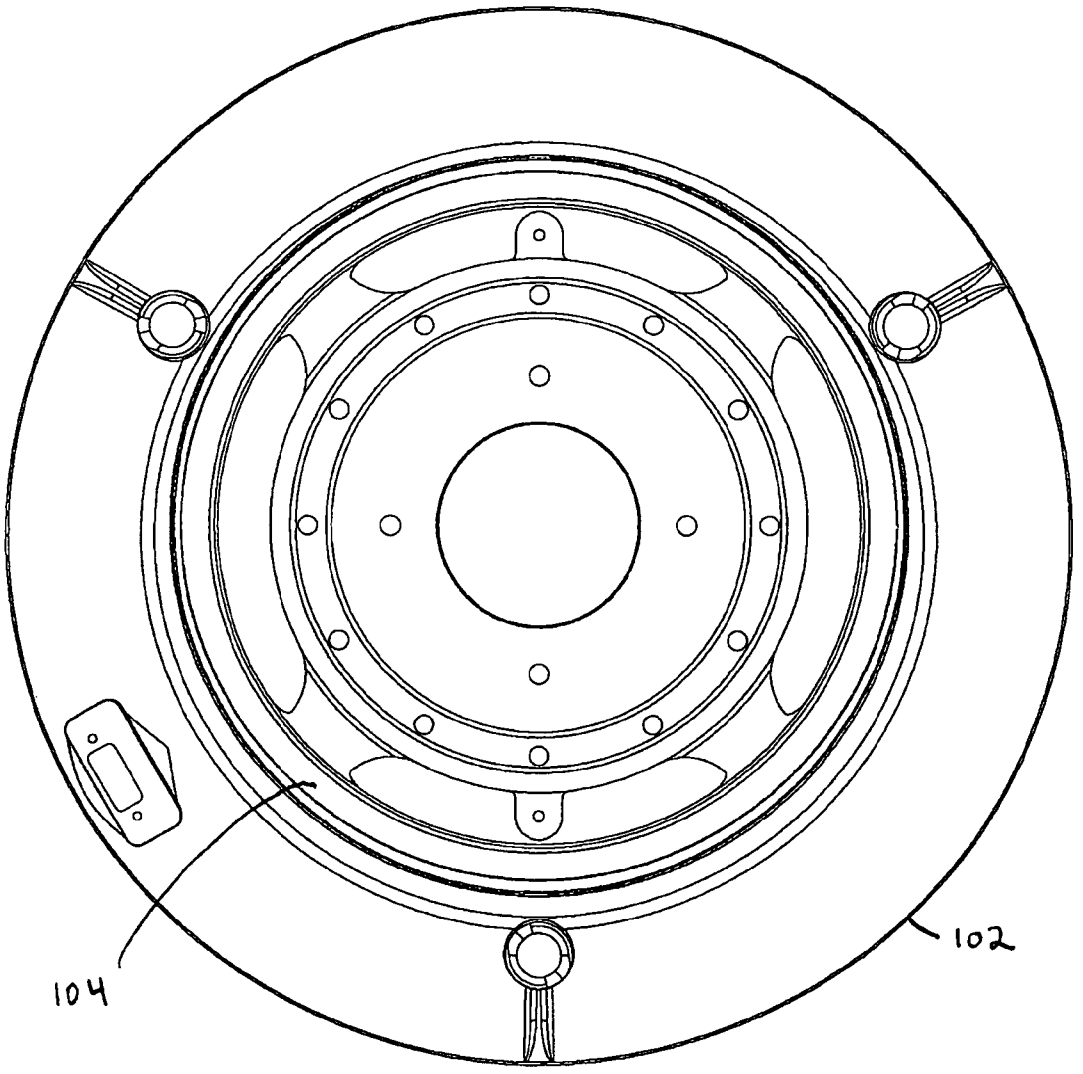


Figure 3

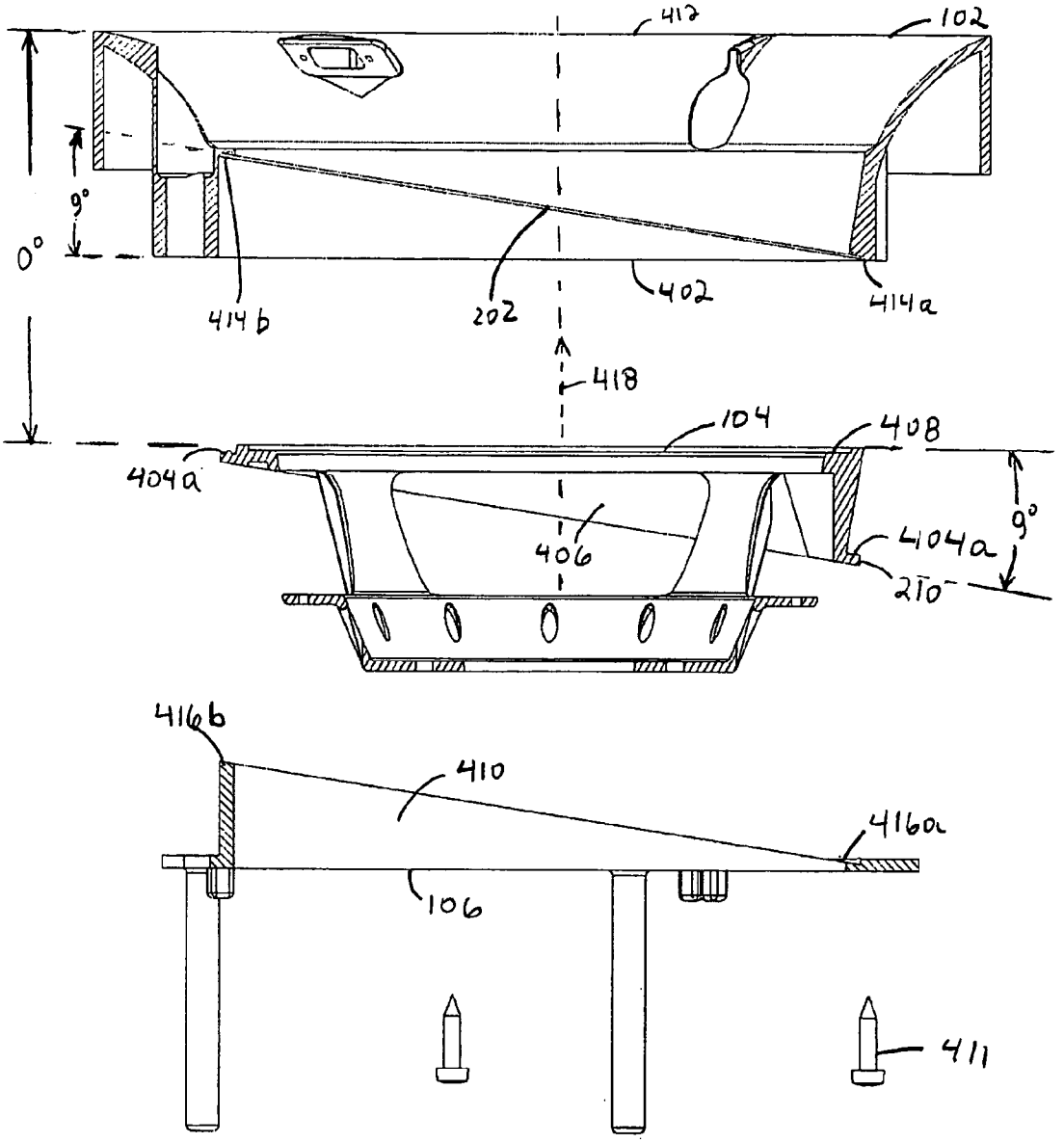

417
102
9°
0°
414b
202
402
414a
418
104
408
404a
406
404a
9°
210
416b
410
416a
106
411

Figure 4

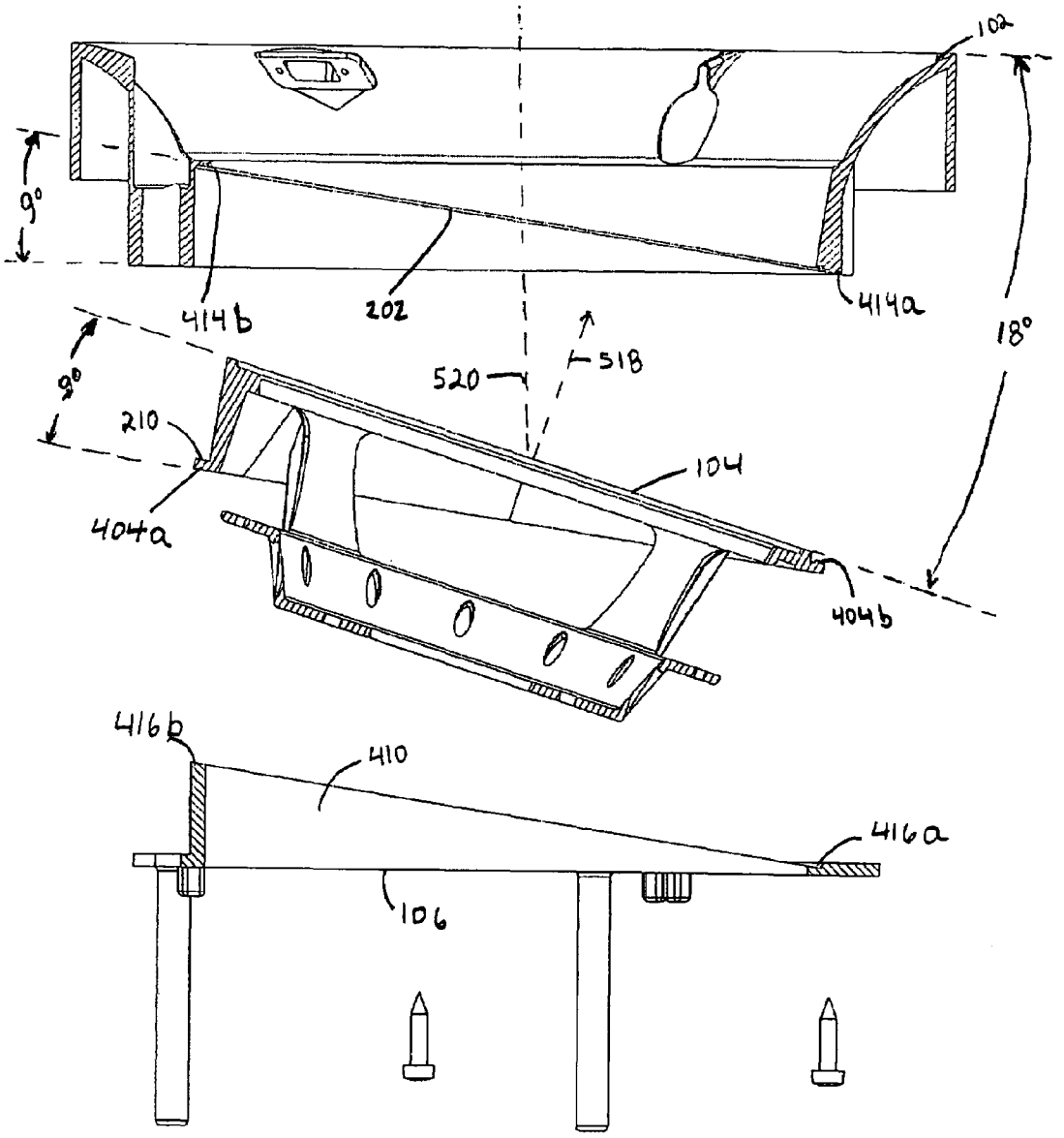

102
9°
414b
202
414a
18°
9°
520
518
210
104
404a
404b
416b
410
416a
106

Figure 5

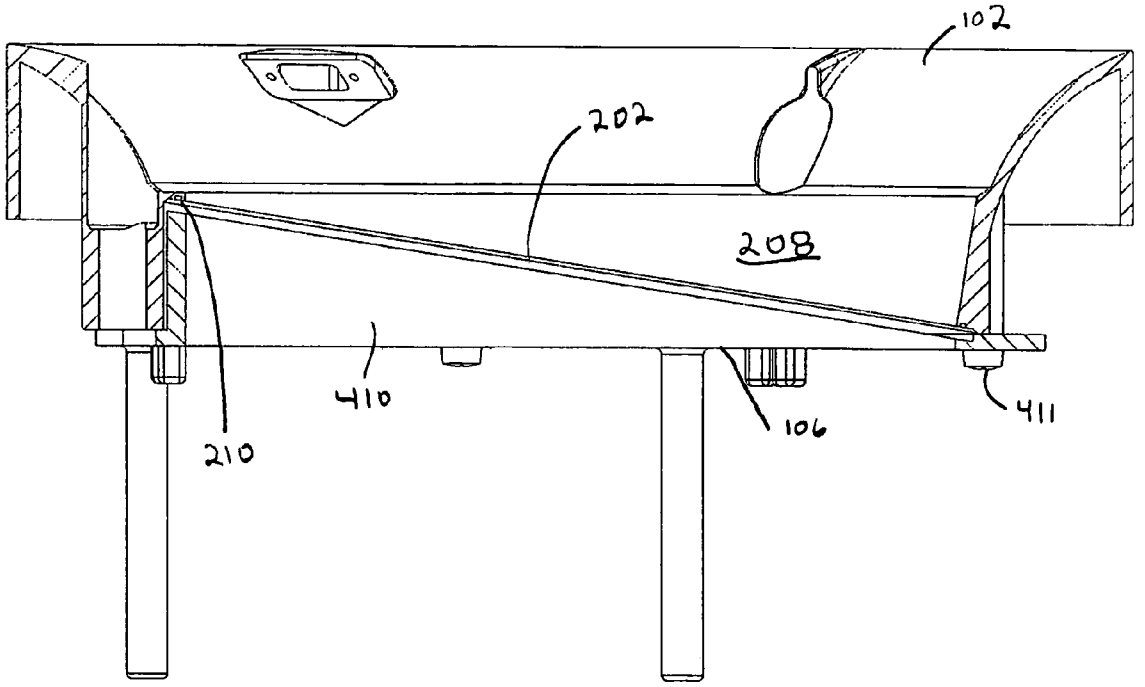


Figure 6

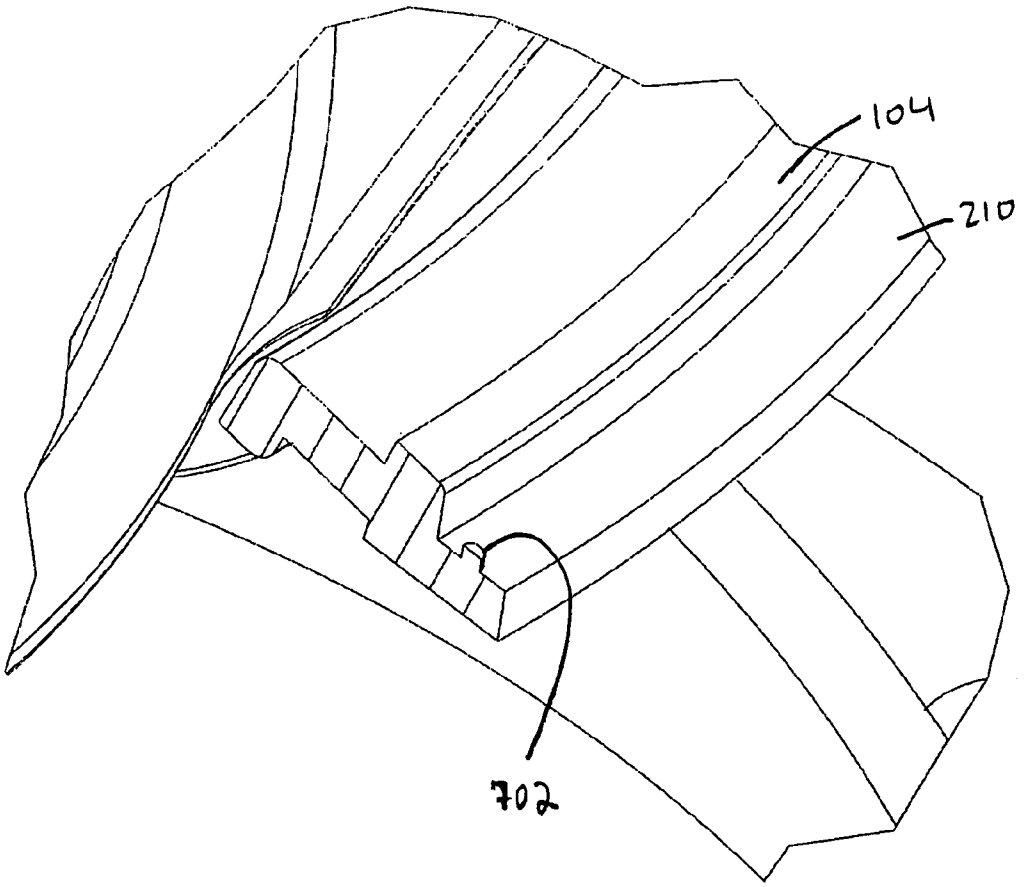


Figure 7

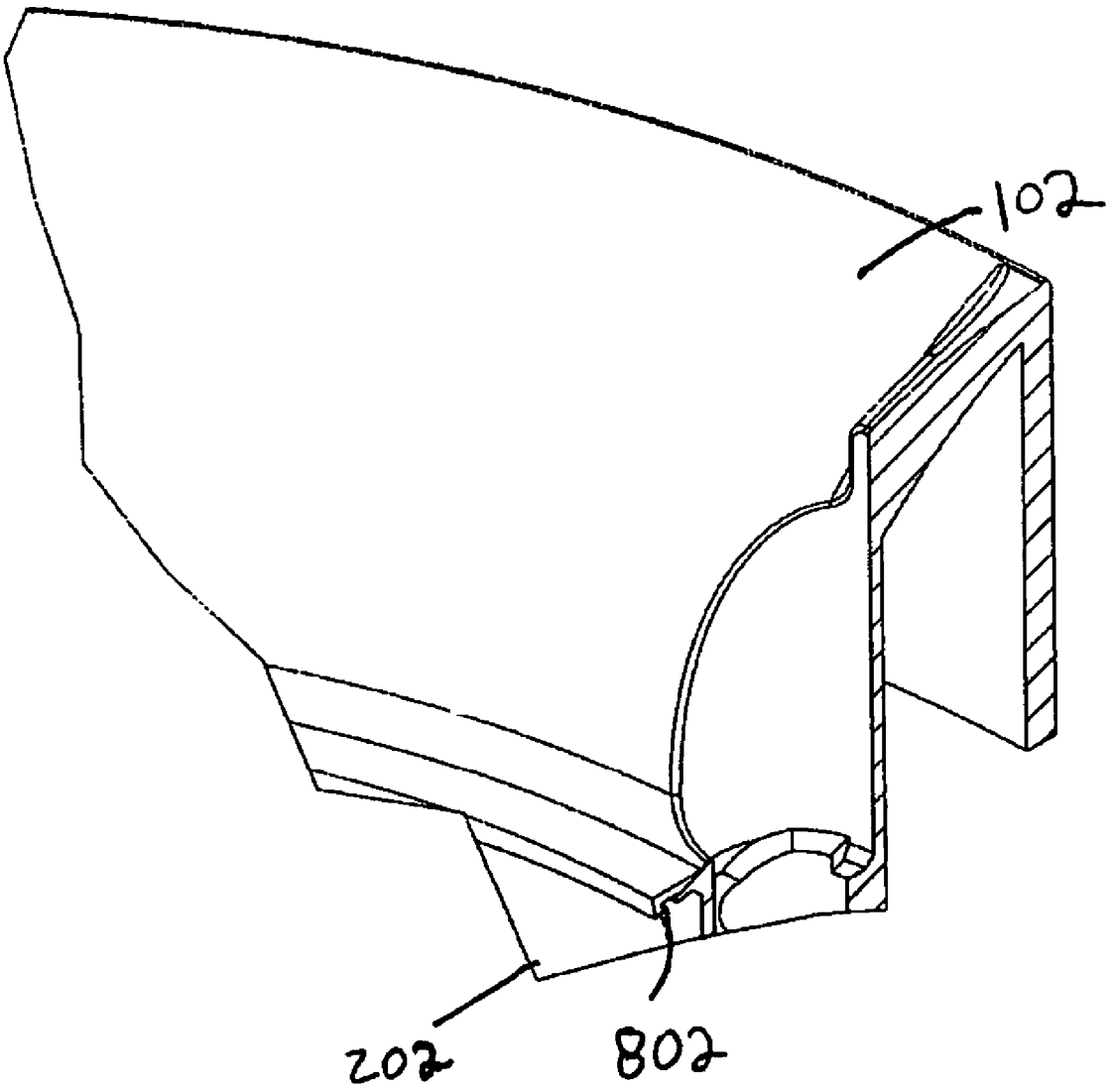


Figure B

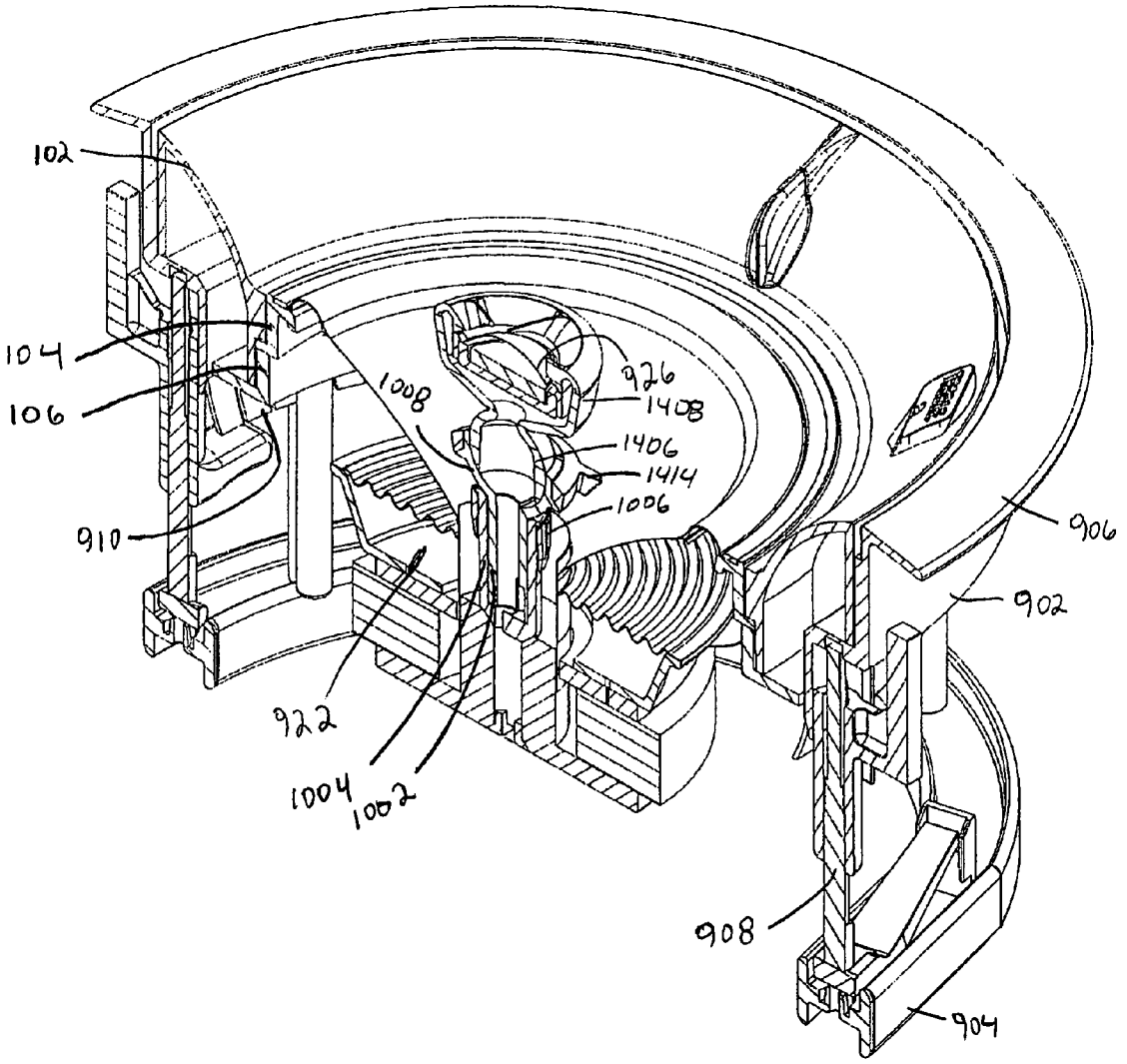

102
104
106
910
926
1408
1406
1414
1006
1008
906
902
922
1004
1002
908
904

Figure 9

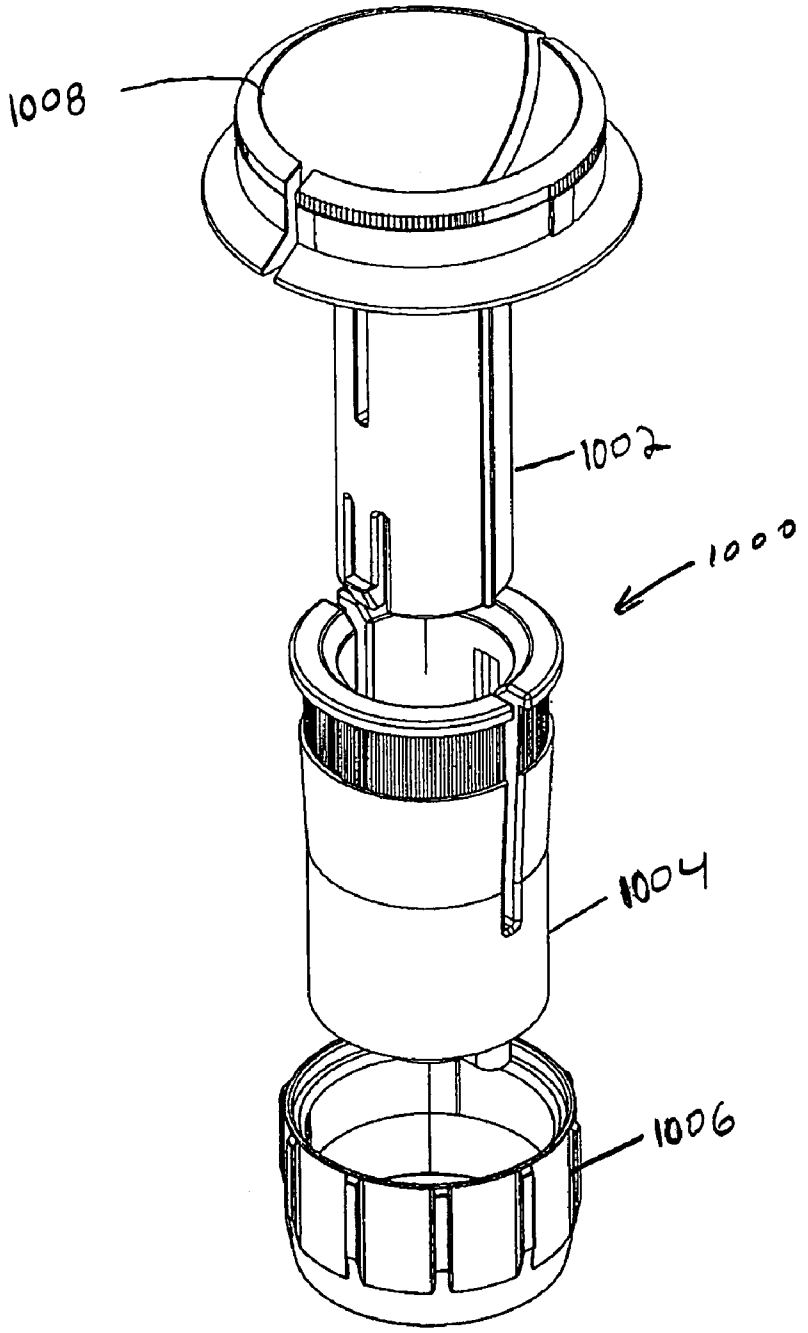


Figure 10

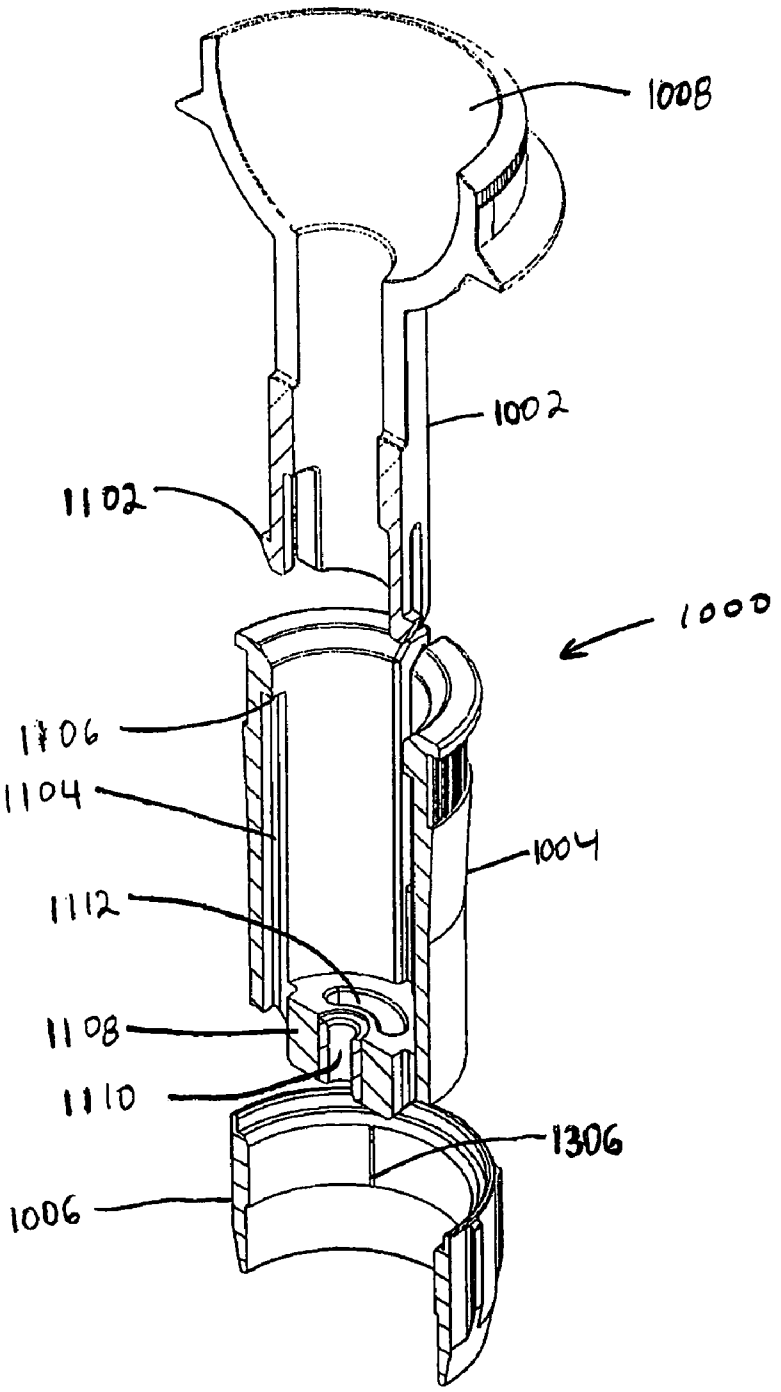


Figure 11

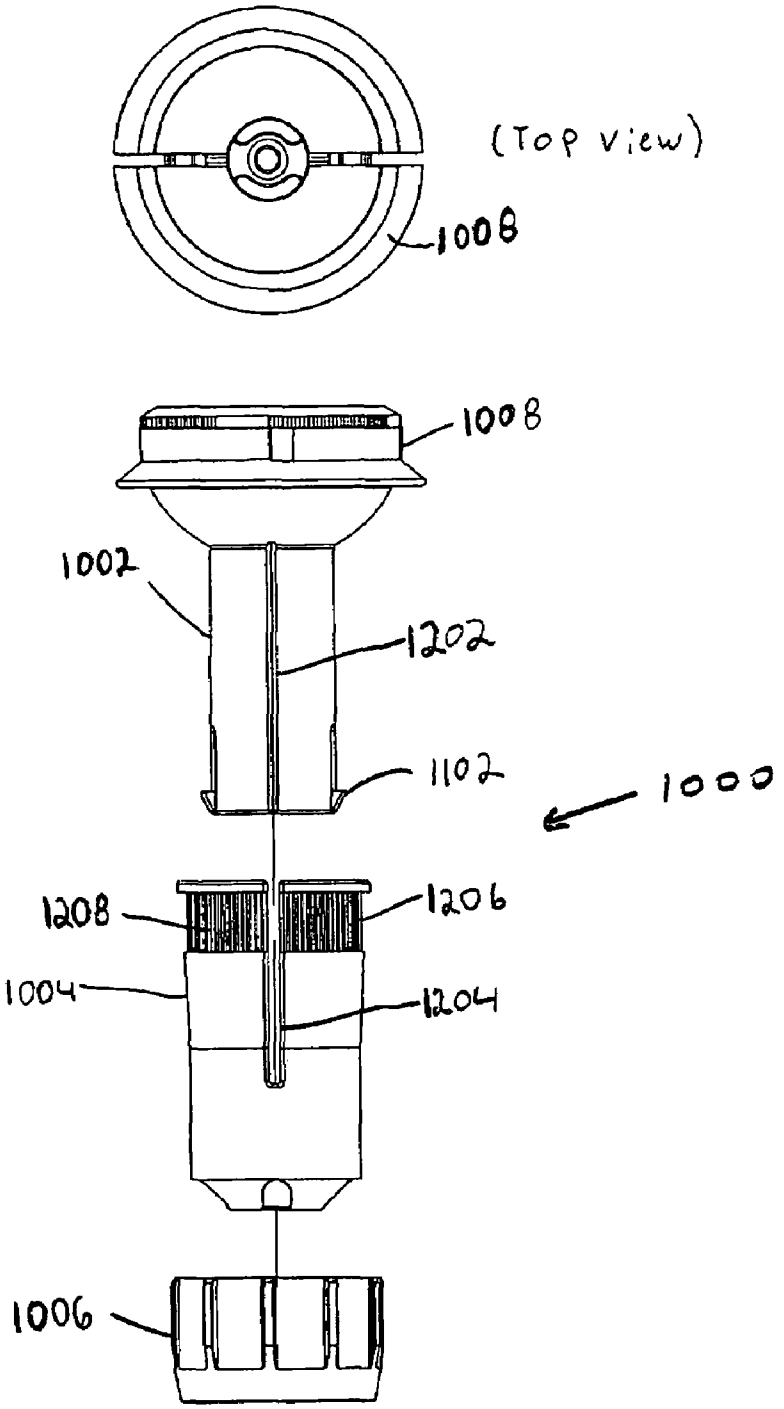

(Top view)
1008
1008
1002
1202
1102
1000
1208
1206
1004
1204
1006

Figure 12

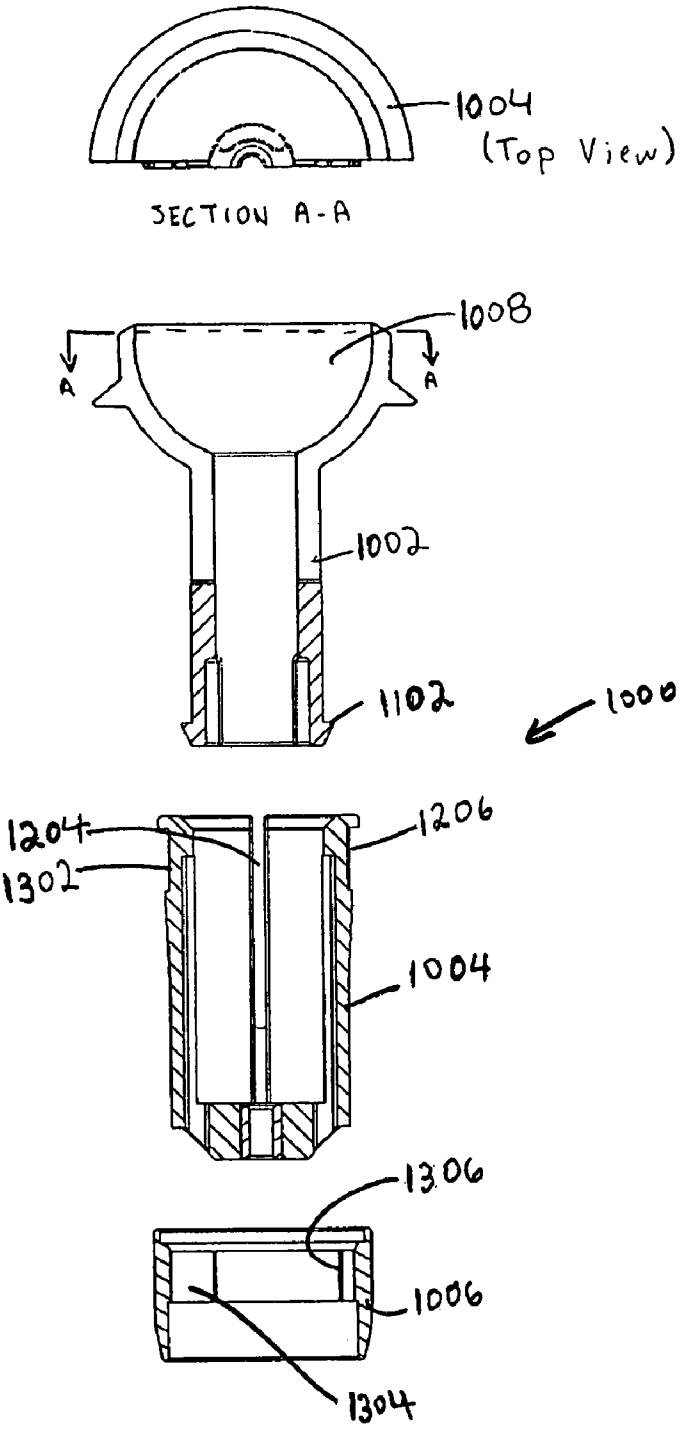

1004
(Top View)
SECTION A-A
1008
A
A
1002
1102
1000
1204
1206
1302
1004
1306
1006
1304

Figure 13

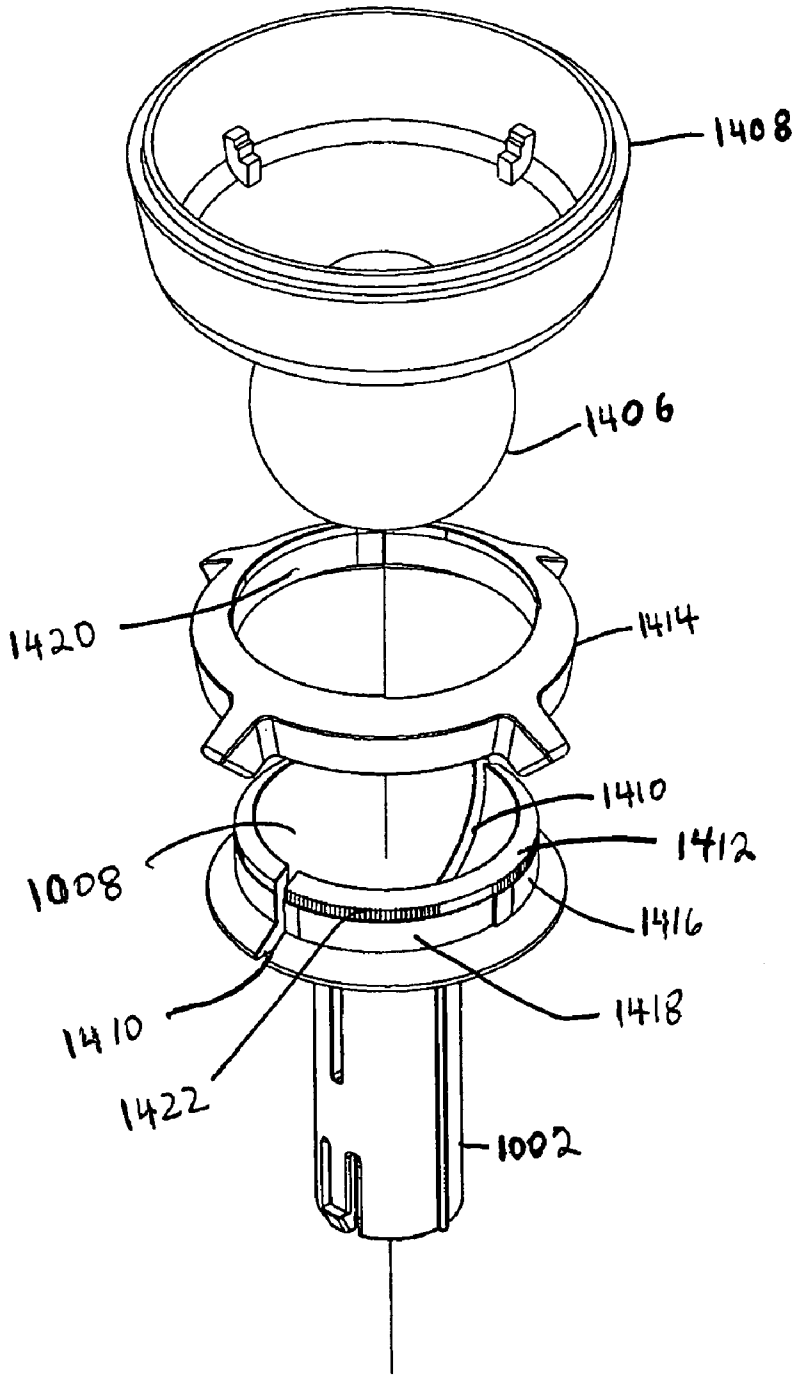


Figure 14

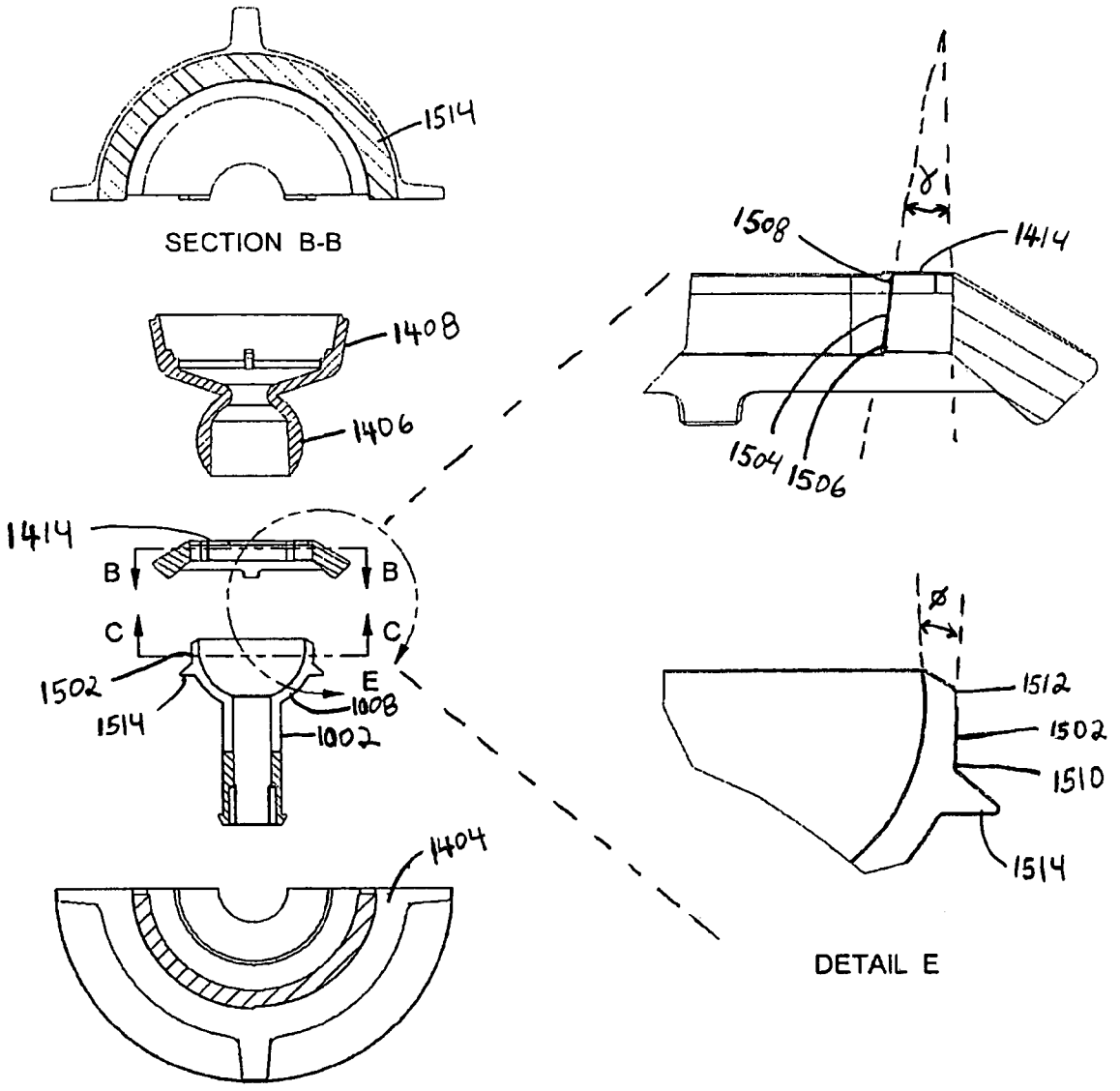

1514
SECTION B-B
1408
1406
1414
B
B
C
C
1502
1514
E
1008
1002
1404
SECTION C-C
1508
1414
γ
1504
1506
ø
1512
1502
1510
1514
DETAIL E

Figure 15

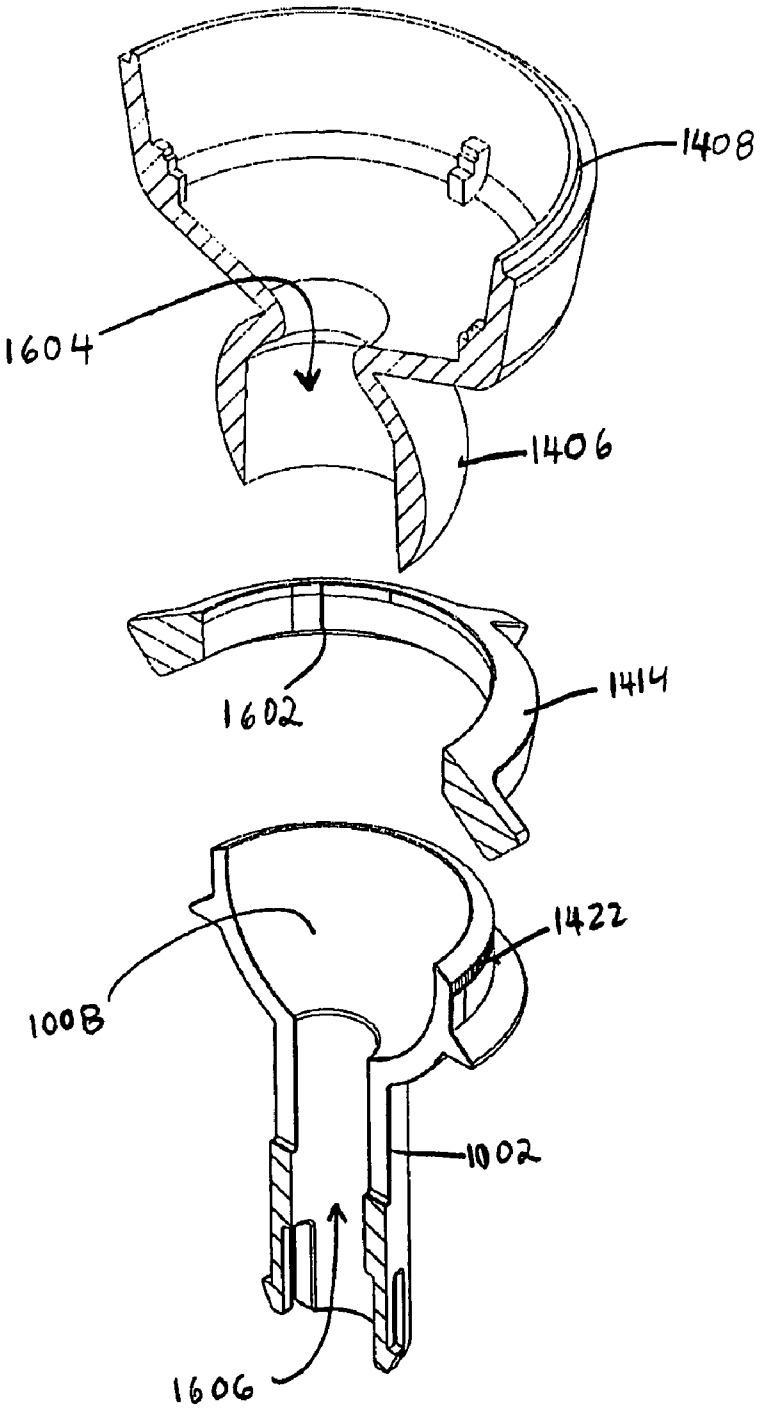


Figure 16

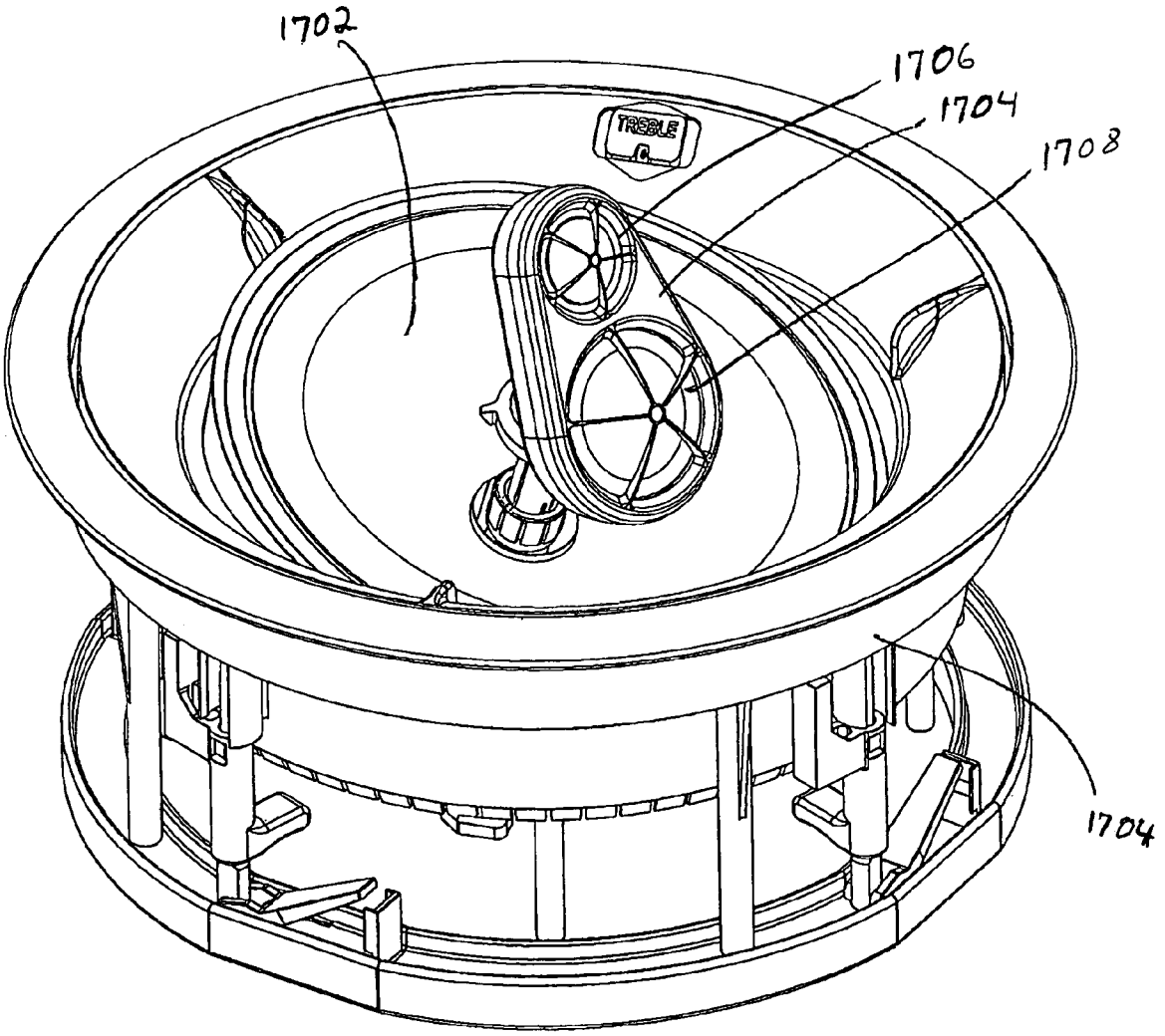


Figure 17

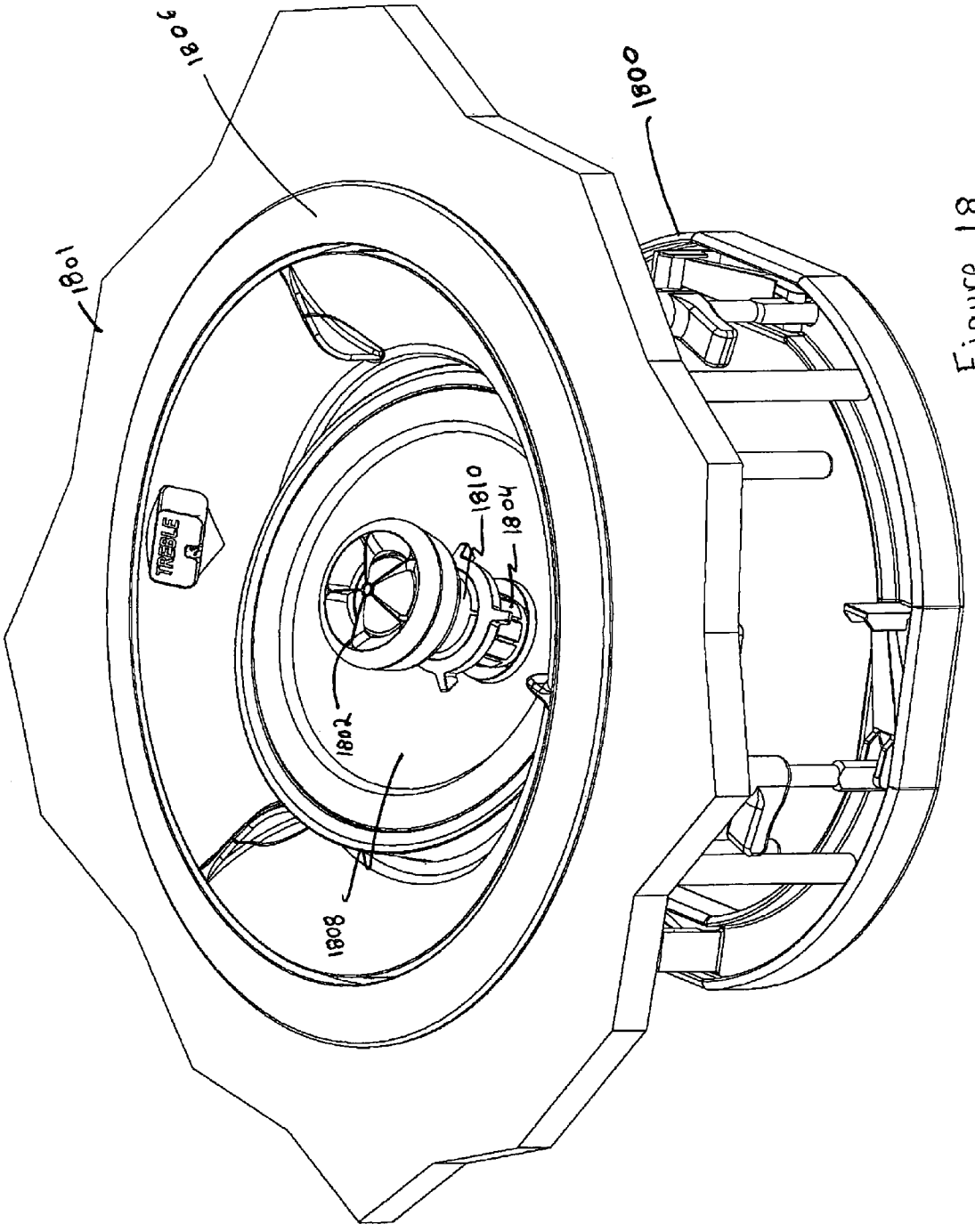


Figure 18

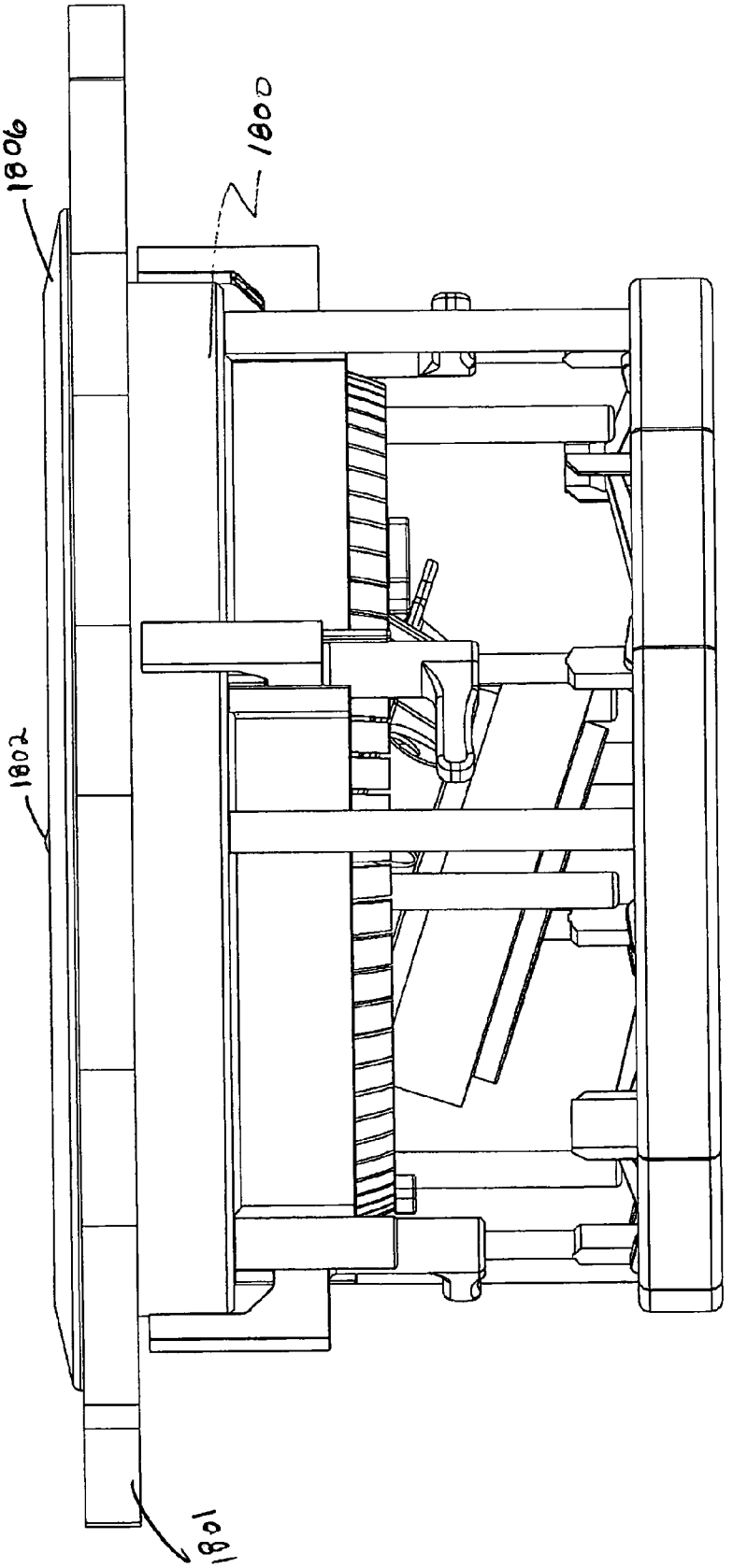


Figure 19

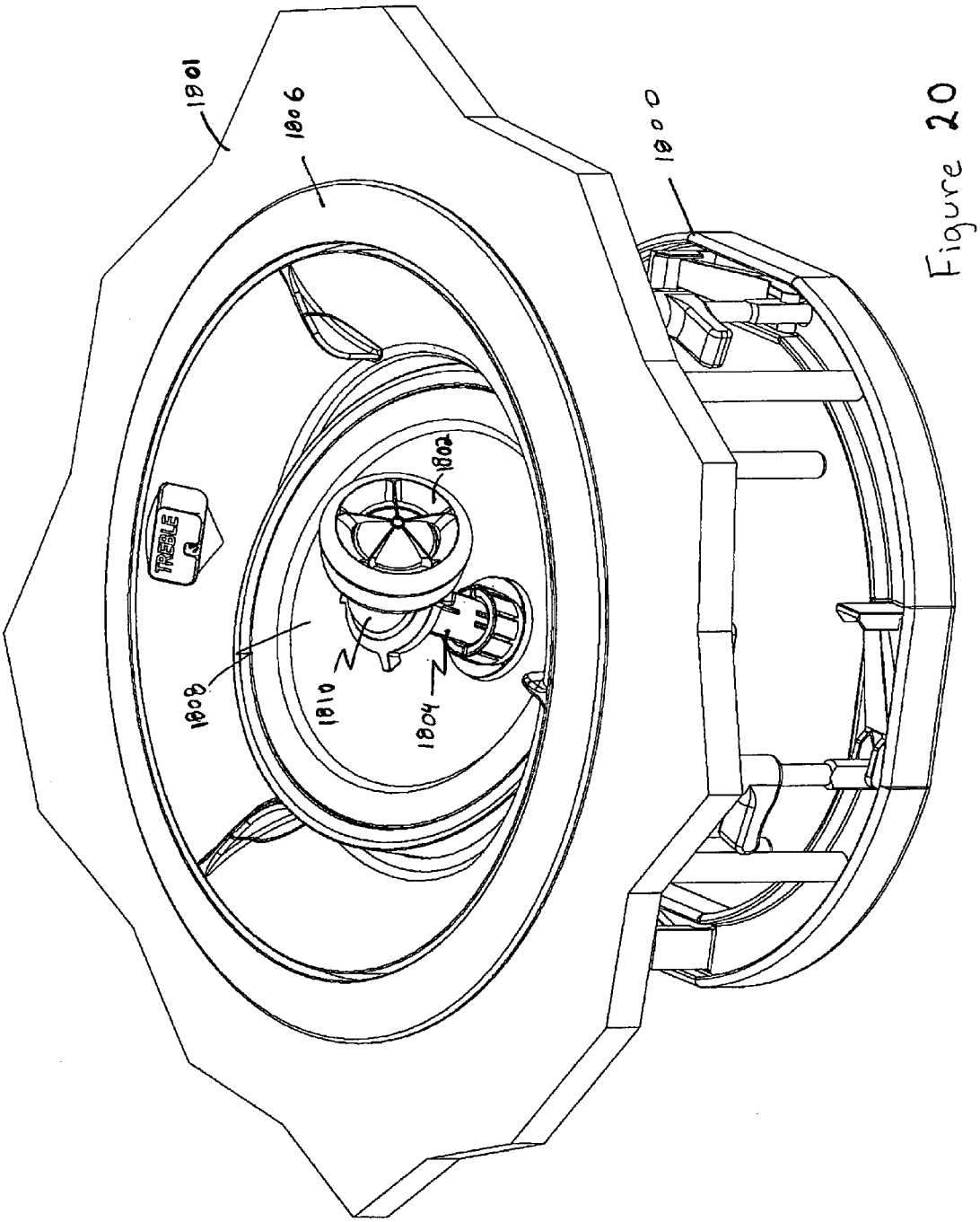


Figure 20

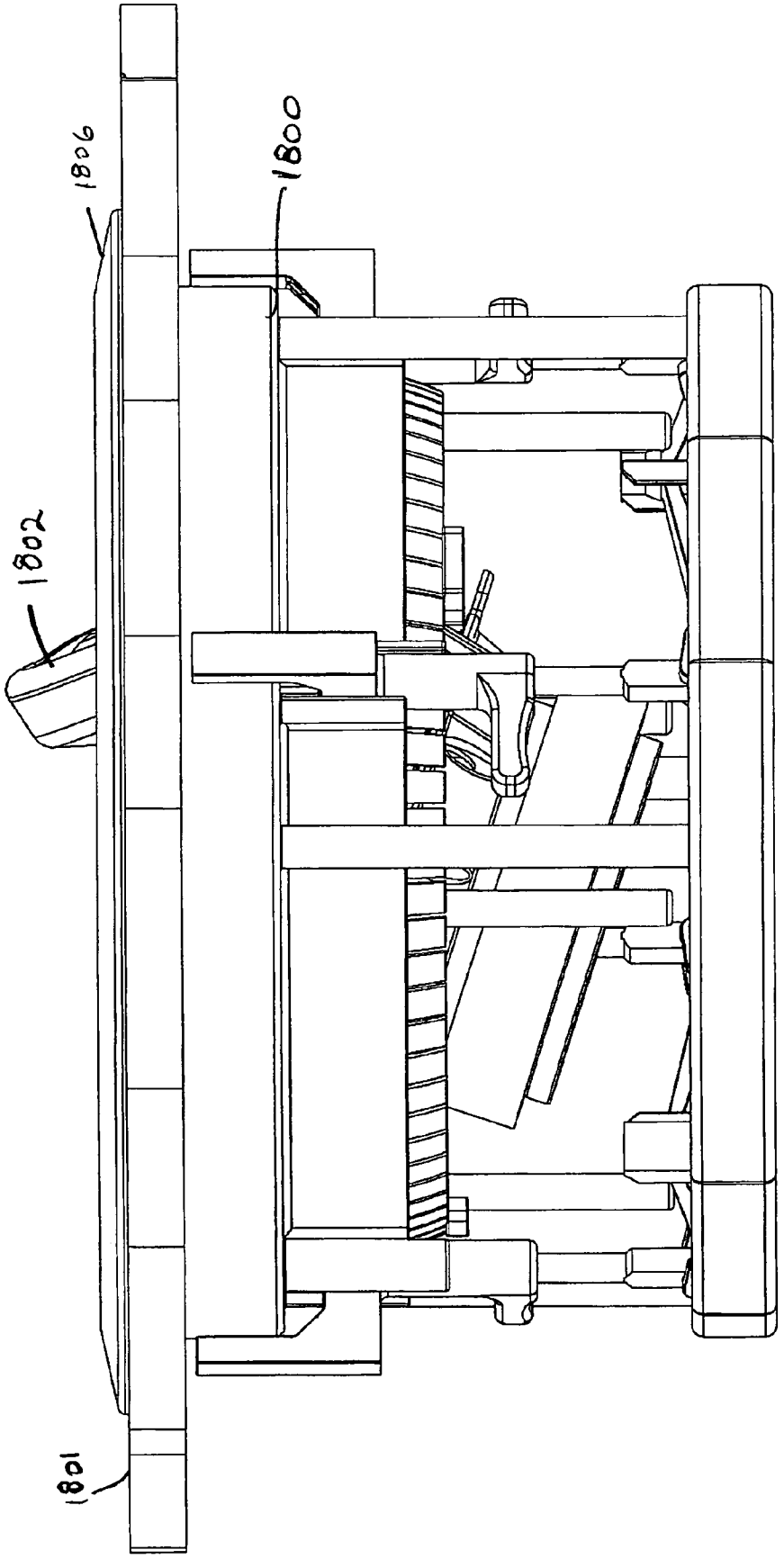


Figure 21

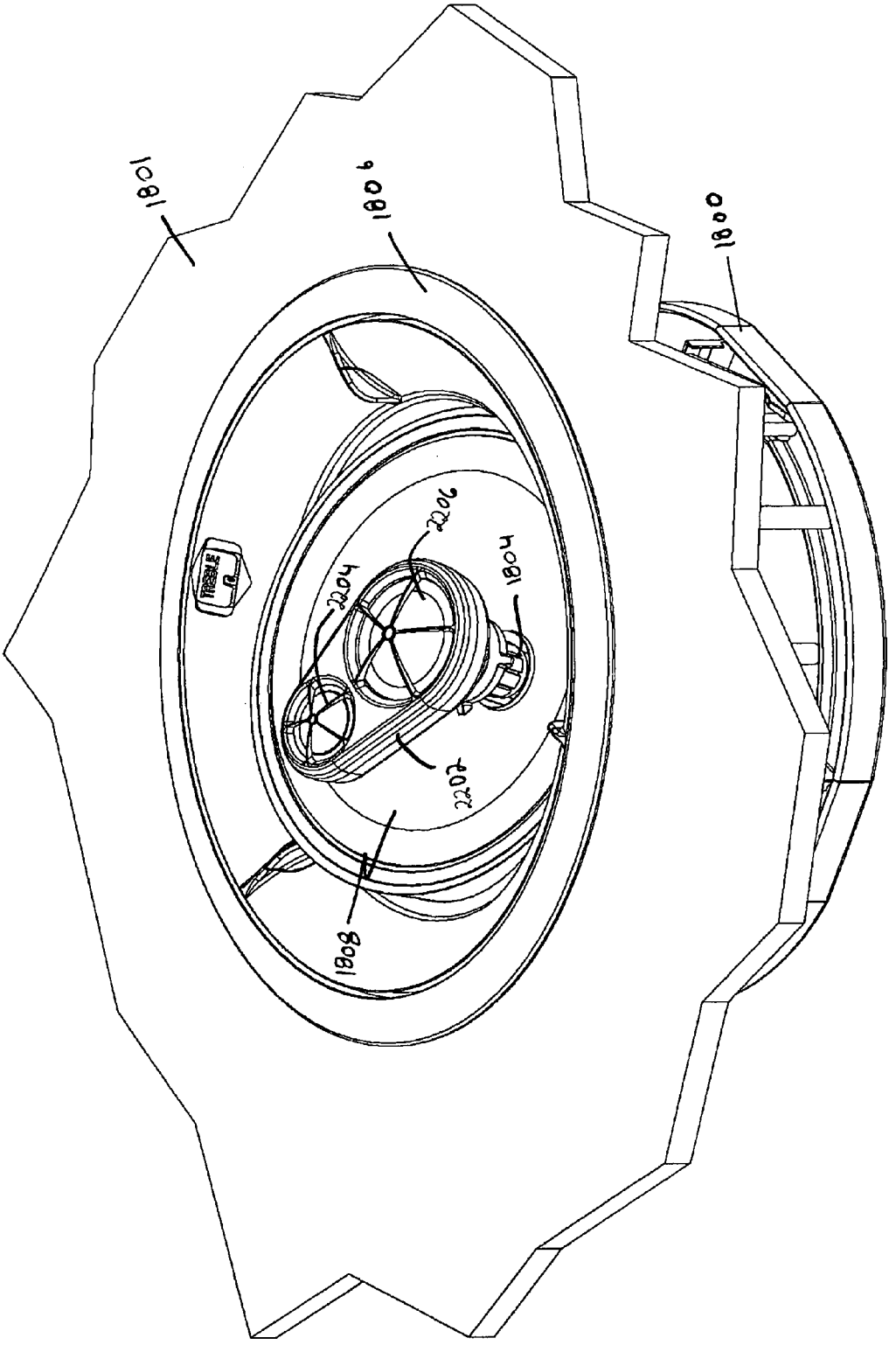


Figure 22

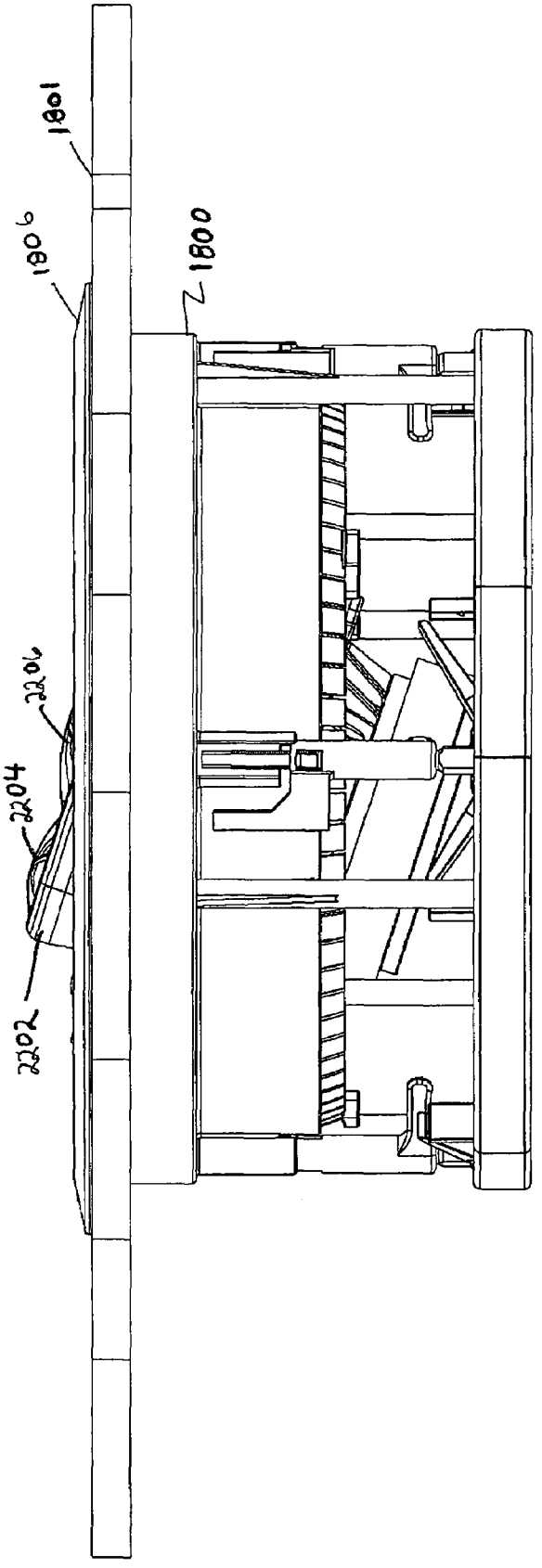


Figure 23

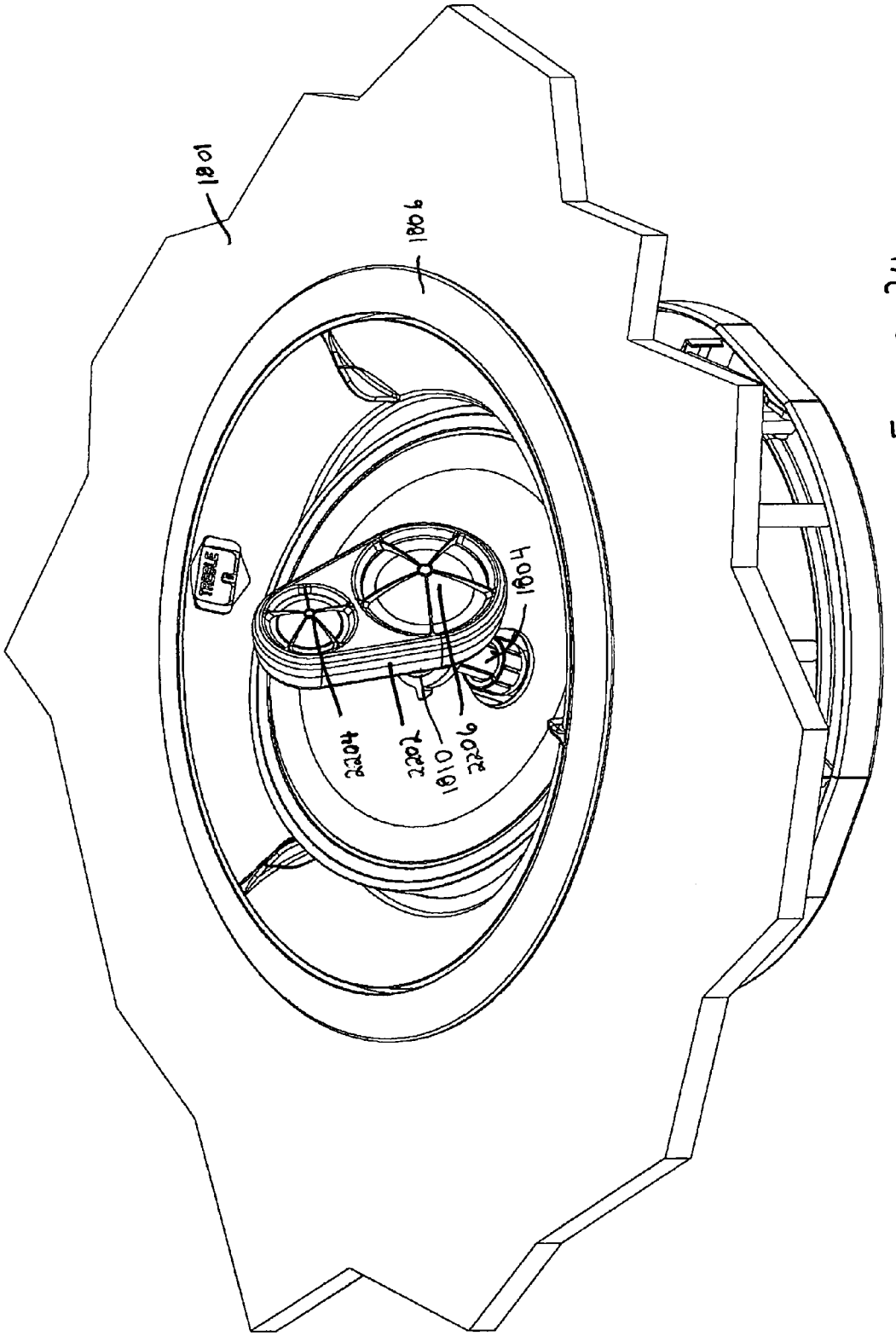


Figure 24

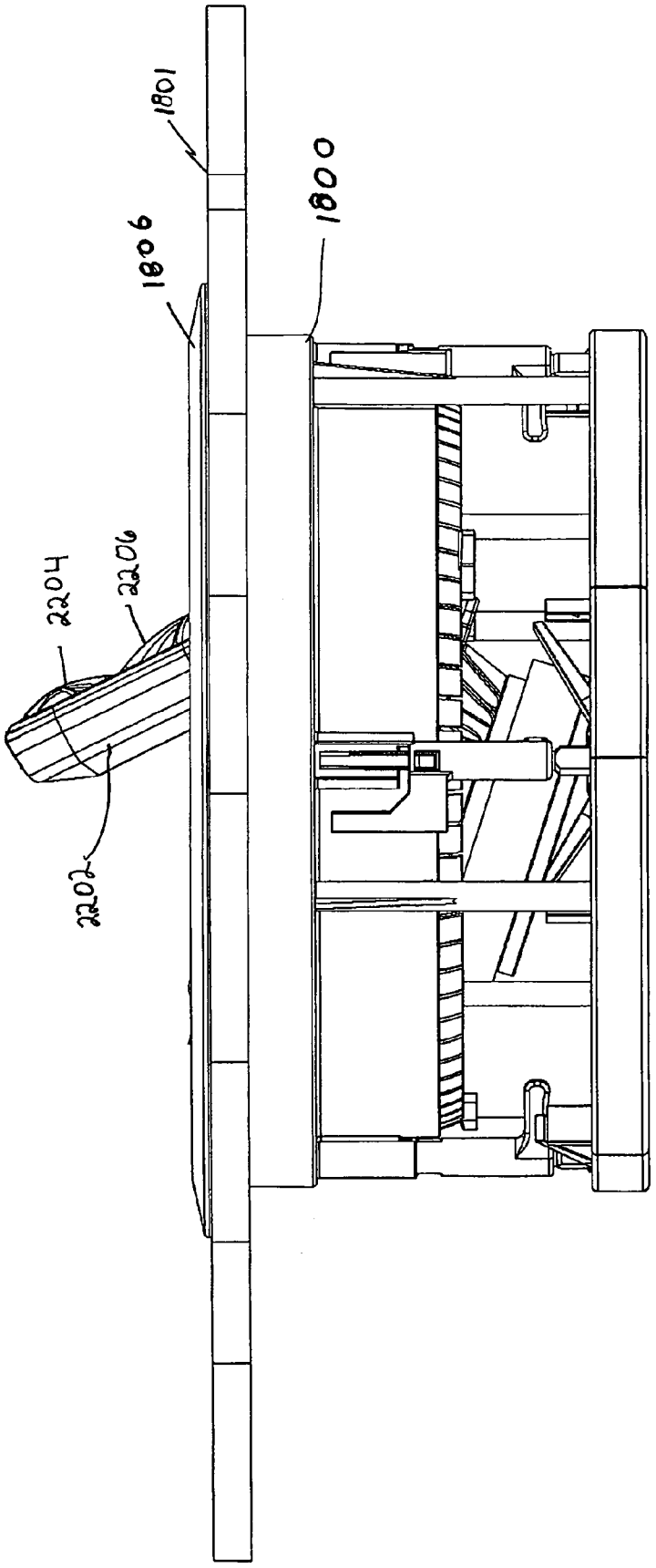


Figure 25

AUDIO DEVICE POST EXTENSION AND ANGLING SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

This non-provisional United States (U.S.) Patent Application is a continuation-in-part application of, and claims priority on, non-provisional U.S. patent application Ser. No. 10/885,861 by Doug Wright et al., titled "Audio Device Post Extension and Angling System", filed on Jul. 7, 2004, now U.S. Pat. No. 7,121,756 and claims priority on, non-provisional U.S. patent application Ser. No. 10/871,111 by Doug Wright, titled "Angled Speaker Assembly", filed on Jun. 18, 2004, both of which claim priority on provisional U.S. Patent Application No. 60/497,752, filed Aug. 26, 2003; and is related to U.S. patent application Ser. No. 10/871,112 by Doug Wright, titled "Tool-less Frame Fastening System", filed on Jun. 18, 2004; and is also related to U.S. patent application Ser. No. 10/871,069 by Doug Wright, titled "Snap-In and Lock Baffle", filed on Jun. 18, 2004. The contents of all these related applications is hereby incorporated by reference.

FIELD

Various embodiments of the invention pertain to in-wall audio devices. More particularly, at least one embodiment of the invention relates to an extendable post and angling system for mounting an audio tweeter within a wall or ceiling recess and a speaker assembly that permits adjusting the dispersion axis of a recessed speaker.

DESCRIPTION OF RELATED ART

In order to save space and/or for aesthetic reasons it is often desirable to mount speakers within a wall or ceiling cavity or recess. Audio devices, such as speakers, woofers and/or tweeters, are often mounted within a wall or ceiling cavity or recess. Various types of frames and/or fasteners are used for the purpose of securing the audio devices within a wall or ceiling cavity.

Mounting such audio devices within a recessed cavity poses several problems. For instance, mounting an audio device inside a ceiling cavity may prevent the sound emitted from such device from directly reaching listeners. A speaker mounted in a wall or ceiling using a conventional frame assembly typically has a sound dispersion axis that is perpendicular to the plane formed by the mounting surface, e.g., wall or ceiling. However, speakers with sound dispersion axes directed at the floor or an opposing wall often do not provide an environment with optimum sound quality. Thus, when installing one or more speakers in a room, it is often desirable to adjust the angle of one or more of the speakers to provide a better sound quality or effect.

It is often necessary or desirable to adjust the direction in which, for instance, a ceiling-mounted speaker radiates sound. For example, when providing a surround sound effect with one or more recessed speakers, the sound dispersion axis of the speakers is adjusted to provide optimum sound quality at a given point or location in the room.

However, conventional speaker mounting systems make it difficult to adjust the sound dispersion axis of a speaker to provide an optimum sound quality. For example, many conventional speakers are fixedly mounted in a wall or ceiling recess and cannot be adjusted. Additionally, even when adjustments to the speakers are possible, prior art mounting

mechanisms are typically restricted to a limited number of positions. This may not always permit directing a speaker's sound dispersion axis to obtain the best sound quality in a particular room or environment.

Adjusting a conventional mounting mechanism to position the audio device at the correct depth, direction, and angle may also be burdensome or impossible. That is, it may not be possible to direct the sound dispersion axis of the recessed audio device to reach a listener directly. As a result sound quality may be affected.

When mounting a tweeter, for instance, the tweeter is typically fixedly secured in a mounting base. The mounting base may then be secured to a supporting mechanism within a ceiling cavity, for instance. However, conventional mounting mechanisms do not permit to easily adjust the position (e.g., depth, direction, and angle) of the tweeter.

Additionally, conventional mounting systems and fasteners are typically cumbersome and time-consuming to install, take many steps to mount, and require the use of several tools. This increases the cost of installation and deployment of, for instance, recessed speakers, lights, or exhaust fans.

Even when the speakers can be adjusted, they are often difficult and/or cumbersome to readjust at a later time. This may be necessary, for instance, in a surround sound speaker configuration that has been setup for optimal sound quality at a first location and now the optimal sound quality is desired at a second location. Such is the case, for example, when a couch is moved from a first location to a second location in a room. Readjusting conventional speakers is typically requires removal and reinstallation of the speaker and/or speaker mounting assembly which is undesirable and costly.

SUMMARY

One embodiment of the invention relates to a speaker mounting assembly including a speaker frame defining a housing to receive a speaker. The speaker frame has a first plane along the face of the speaker frame. The speaker frame includes a flange around the perimeter of the speaker frame, the flange defines a second plane that is at an angle to the first plane. The speaker frame also includes a baffle which defines an interior opening to receive the speaker frame and a third plane along the face of the baffle. The baffle includes an angled ridge along the perimeter of the interior opening, the ridge defining a fourth plane that is at an angle to the third plane, the ridge defining a perimeter that is smaller than the perimeter defined by the flange. The ridge to support the flange when the speaker frame is coupled to the baffle. A clamp frame is coupled to the baffle to secure the speaker frame between the baffle and the clamp frame while permitting the speaker frame to rotate about a first axis perpendicular to the first plane. The angle of the first plane of the speaker frame, relative to the third plane of the baffle, being adjustable within a range by rotating the speaker frame about the first axis.

The speaker mounting assembly includes a groove that is formed by the clamp frame and the ridge when the clamp is coupled to the baffle. The flange slides within this groove when the speaker frame is rotated about the first axis. The baffle further includes a grooved channel along a first section defining the interior opening, the grooved channel to receive a stop pin coupled to the flange and limit the rotation of the speaker frame to the first section.

As a result of this construction, the speaker frame assembly is capable of being adjusted to any angle, relative to the third

plane of the baffle, between a minimum angle and a maximum angle by rotating the speaker frame assembly about the first axis.

Another embodiment of the invention provides a post extension and angling system for mounting fixtures/audio devices within a recess in a wall or ceiling that can be adjusted and installed with minimal time and effort. One feature of the invention provides a post extension and angling mechanism that can be manually installed and/or adjusted to set the depth, direction and angle of an audio device so as to be able to position the sound dispersion axis of the audio device (e.g., speaker, tweeter, woofer, audio transducer, etc.) directly towards a listener.

According to one implementation of the invention, a method and system for extending the position of a ceiling-mounted tweeter to just below the ceiling surface is provided. Making the tweeter system extendable, in concert an angling system, enables the tweeter to be placed in a position that allows the listener to be directly on-axis with the tweeter, even when the listener is at an extreme angle to the speaker system. By making the tweeter system extendable, as opposed to being fixed in an extended position, the installer has the option of retaining a more conventional "flush" installation for those occasions when the installation is more aesthetically sensitive than acoustically sensitive.

According to one embodiment of the invention, a recessed speaker assembly is mounted inside an opening in a ceiling, wall, or other surface with the exposed face trim sitting substantially flush with the mounting surface. One or more audio devices and may be mounted within the recessed speaker assembly. For example, a first audio device may be a speaker or woofer, and a second audio device may be a tweeter, mid-range speaker, and/or sub-woofer.

The first audio device may be supported by a rotating angling system. The second audio device may be supported on a ball-and-socket angling system that is coupled to the telescoping post mechanism. This permits independent adjustment of the position and/or angle of the second audio device relative to the first audio device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates an exploded perspective view of a speaker mounting assembly according to one embodiment of the invention.

FIG. **2** illustrates a perspective cross-sectional view of the speaker mounting assembly of FIG. **1** according to one embodiment of the invention.

FIG. **3** illustrates a frontal view of the speaker mounting assembly of FIG. **1** according to one embodiment of the invention.

FIG. **4** illustrates an exploded sectional view of the speaker mounting assembly of FIG. **3** with the speaker frame in a first position according to one embodiment of the invention.

FIG. **5** illustrates an exploded cross-sectional view of the speaker mounting assembly of FIG. **3** with the speaker frame in a second position according to one embodiment of the invention.

FIG. **6** illustrates a cross-sectional side view of the assembled speaker mounting assembly of FIG. **1** according to one embodiment of the invention.

FIG. **7** illustrates a rotation stop pin for the speaker mounting assembly of FIG. **1** according to one embodiment of the invention.

FIG. **8** illustrates a baffle having a groove along its ridge to accept a rotation stop pin according to one embodiment of the invention.

FIG. **9** illustrates a cross-sectional view of a tool-less fastening system in which the speaker mounting assembly of FIG. **1** may be inserted and secured according to one embodiment of the invention.

FIG. **10** illustrates an extension post mechanism according to one embodiment of the invention.

FIG. **11** illustrates a sectional view of the extension post mechanism illustrated in FIG. **1** according to one implementation of the invention.

FIG. **12** illustrates a side view of the extension post mechanism illustrated in FIG. **1** according to one implementation of the invention.

FIG. **13** illustrates a sectional view of the extension post mechanism illustrated in FIG. **1** according to one implementation of the invention.

FIG. **14** illustrates a retaining and angling mechanism that may operate with an extension post mechanism according to one implementation of the invention.

FIG. **15** is a sectional view of the retaining and angling mechanism in FIG. **14** according to one embodiment of the invention.

FIG. **16** illustrates a perspective sectional view of the reverse angle retention system of FIG. **14** according to one implementation of the invention.

FIG. **17** illustrates a perspective view of an audio device having an extension post and the retaining and angling mechanism to hold two or more audio transducer devices according to one embodiment of the invention.

FIGS. **18**, **19**, **20**, and **21** illustrate a recessed speaker assembly having the extension post mechanism of FIGS. **10-13** and the angling mechanism of FIGS. **14-16** for a single audio device according to one embodiment of the invention.

FIGS. **22**, **23**, **24**, and **25** illustrate a recessed speaker assembly having the extension post mechanism of FIGS. **10-13** and the angling mechanism of FIGS. **14-16** for multiple audio devices according to one embodiment of the invention.

DETAILED DESCRIPTION

In the following description numerous specific details are set forth in order to provide a thorough understanding of the invention. However, one skilled in the art would recognize that the invention may be practiced without these specific details. In other instances, well known methods, procedures, and/or components have not been described in detail so as not to unnecessarily obscure aspects of the invention.

In the following description, certain terminology is used to describe certain features of one or more embodiments of the invention. For instance, "fastener" and "retainer" are interchangeably used to refer to any type of securing mechanism. The term "audio device" is used to refer to any type of sound-generating device, including a speaker, loudspeaker, audio speaker, woofer, subwoofer, tweeter, and/or acoustic transducer. The term "manually" refers to a motion or task performed by hand and without the aid of a tool. The terms "telescoping", "extendable", and "adjustable" are used interchangeably to refer to a mechanism that can increase and decrease in length or that can be extended and retracted relative to a reference point.

One aspect of the invention provides a speaker mounting assembly that permits positioning the sound dispersion axis of a recessed speaker in any direction and at any desired angle within a range of angles. Another aspect of the invention permits manually readjusting the direction and angle of a speaker without removal of the speaker.

FIG. **1** illustrates an exploded perspective view of a speaker mounting assembly **100** according to one embodiment of the

invention. The speaker mounting assembly **100** includes a rotating baffle **102**, a speaker frame **104**, and a speaker frame clamp **106**. The rotating baffle **102** is rotationally mounted and secured to a mounting assembly, typically, within a wall or ceiling recess. The baffle **102** also includes an opening **108** to permit sounds from a speaker mounted on the speaker frame **104** to propagate. The speaker frame **104** may house an audio speaker and is rotationally secured to the rotating baffle **102** by the frame clamp **106**.

FIG. **2** illustrates a perspective cross-sectional view of the speaker mounting assembly of FIG. **1** according to one embodiment of the invention. The baffle **102** includes a ridge **202** angled from a first end **204** to a second end **206** of the interior vertical wall **208** defining the opening **108**. That is, the ridge **202** extends all the way around the interior vertical wall **208** but at a different height along the wall **208**. Consequently, the plane defined by the ridge **202** is at an angle to the planed defined by the face of the baffle.

The ridge **202** protrudes from the vertical wall **208** such that opening **108** has a slightly smaller diameter at the baffle **102** face than at the rear portion of the baffle **102**. The opening **108** has a diameter large enough to permit the speaker frame **104** to be mounted therein. The ridge **202** slightly reduces the diameter of the opening **108** such that the speaker frame **104** rests on the ridge **202**. This causes the speaker frame **104** to rest on the ridge **202** when the speaker mounting assembly is assembled. When resting against the ridge **202**, the speaker frame **104** is able to slide on the ridge **202** and rotate within the baffle **102**. The speaker frame **104** may include a flange **210**, around the circumference of the frame, which slides against the ridge **202**.

The speaker frame clamp **106** secures the frame assembly **104** to the baffle **102**. One implementation of the speaker frame clamp **106** includes a securing ring **212** through which fasteners **214** may be placed to fixedly couple the frame clamp **106** to the baffle **102**.

FIG. **3** illustrates a frontal view of the speaker mounting assembly of FIG. **1** according to one embodiment of the invention. The speaker frame **104** is inserted within the baffle **102** when the mounting assembly is assembled.

FIG. **4** illustrates an exploded sectional view of the speaker mounting assembly of FIG. **3** with the speaker frame in a first position according to one embodiment of the invention. This figure illustrates the orientation of the speaker frame **104** relative to the baffle **102** in a first position. In this embodiment of the invention, the ridge **202** has an angle of approximately nine (9) degrees relative to the rear plane **402** of the speaker frame **104**.

The speaker frame **104** also includes an angled flange **210** along the perimeter of a vertical wall **406**. In one implementation of the invention the flange **210** is angled by making he vertical wall **406** higher at one than at a second end. Consequently, the plane defined by the flange **210** is at an angle relative to the plane defined by the speaker frame's face plane **408**.

In one implementation, the angled flange **210** has the same angle as the ridge **202**, (e.g., nine (9) degrees) relative to the face plane **408** of the speaker frame **104**. When assembled, the speaker frame **104** is inserted into the baffle **102** so that the flange **210** sits on the ridge **202**.

The speaker frame clamp **106** is then inserted into the baffle **102**. In one implementation of the invention, the speaker frame clamp **106** includes an angled wall **410** with the same angle as the angled flange **210** of the speaker frame **104**. When assembled, the speaker frame clamp **106** is inserted into the baffle **102** to retain the speaker frame **104** within the baffle **102**. The angled wall **410** and the ridge **202** form a groove in which the speaker frame flange **210** can slide. One or more fasteners **411** serve to couple the speaker frame clamp **106** to the baffle **102**.

FIG. **4** illustrates a first position or orientation of the speaker frame. In this position, the angle of the ridge **202** and the angle of the flange **410** substantially cancel each other such that the speaker frame face plane **408** is substantially parallel to the baffle face plane **412**. When assembled, the speaker frame flange portion **404***a* rests against the ridge portion **414***a*. Similarly, speaker frame flange portion **404***b* rests against ridge portion **414***b*. The angled wall portions **416***a* and **416***b* are inserted adjacent to the speaker frame flange portions **404***a* and **404***b* respectively. In this position, a speaker mounted within the speaker frame **104** would have a sound dispersion axis **418** substantially perpendicular to the face of the face plane **412** of the baffle **408** mounting surface, e.g., wall or ceiling.

FIG. **5** illustrates an exploded cross-sectional view of the speaker mounting assembly of FIG. **3** with the speaker frame in a second position according to one embodiment of the invention. In FIG. **5**, the speaker frame **104** has been rotated one hundred and eighty (180) degrees from the position illustrated in FIG. **4** relative to the baffle **102**. In this orientation, the angle of the ridge **202** and the angle of the flange **210** are cumulative such that the speaker frame face plane **408** is at an angle to the baffle face plane **412**. For example, if the angle of the ridge **202** is nine (9) degrees and the angle of the flange **210** is nine (9) degrees, then the maximum angle that can be formed by the ridge **202** and flange **210** is eighteen (18) degrees.

In FIG. **5**, the speaker frame flange portion **404***a* rests against ridge portion **414***b* while flange portion **404***b* rests against ridge portion **414***a*. In this position, a speaker mounted within the speaker frame **104** would have a sound dispersion axis **518** angled at eighteen (18) degrees from an axis **520** perpendicular to the mounting surface, e.g., wall or ceiling.

As a result of the angled ridge **202** and angled flange **210**, the speaker frame **104** can be adjusted to any angle within a range, e.g., zero degrees and a maximum angle, by rotating the speaker frame **104**. This permits adjusting the sound dispersion axis **518** to any angle within the range. The maximum angle that can be achieved being dependent on the sum of the relative angle of the ridge and the relative angle of the flange.

By forming a groove or channel between the angled ridge **202** and the vertical wall **410**, the speaker frame flange **210** is able to slide in this groove. In this manner, the speaker frame **104** can be rotated to direct the sound dispersion axis **518** of a speaker mounted thereon to a desired location within a room or environment. The ease with which the speaker frame **104** can be turned is adjusted by slightly increasing or reducing the size of the groove so as to create a looser or tighter fit with the flange **210**. As previously noted, this can be accomplished by loosening or tightening the fasteners **411** to adjust the separation between the frame clamp's vertical wall **410** and baffle's angled ridge **202**.

FIG. **6** illustrates a cross-sectional side view of the assembled speaker mounting assembly of FIG. **1** according to one embodiment of the invention. As shown, the speaker frame clamp **106** is coupled to the baffle **102** using a plurality of fasteners **411**. The speaker frame flange **210** is held be between the frame clamp's angled wall **410** and the baffle's ridge **202**. The frame clamp **106** is positioned within the baffle **102** so that the angled wall **410** complements the angle of the ridge **202**. This results in an evenly spaced groove for the speaker frame flange **210**.

According to one implementation of the invention, the speaker frame **104** can rotate within the groove when the fasteners **411** are loosened slightly. Once adjusted to a desired position, the fasteners **411** are tightened, thereby reducing the size of the groove formed by the angled wall **410** and ridge **202**, to prevent any further rotation of the speaker frame **104**.

Another aspect of the invention provides a way to limit the rotation of the speaker frame **104**. This prevents speaker wires from being torn or tangled if a speaker frame **104** is rotated many times in one direction.

FIG. **7** illustrates a rotation stop pin **702** for the speaker mounting assembly **100** of FIG. **1** according to one embodiment of the invention. The speaker frame **104** includes a stop pin **702** along the speaker frame flange **210**. When the speaker mounting assembly **100** is assembled, the stop pin **702** limits the rotation of the speaker frame **104**.

According to one implementation of the invention, illustrated in FIG. **8**, the baffle's ridge **202** includes a groove **802** along a portion of the ridge **202** in which the stop pin **702** can ride. Thus, the length of the groove **802** in the ridge **202** limits the rotation of the speaker frame **104**. For example, the groove **802** may run only half way along the circumference of the ridge **202** to limit the rotation of the speaker frame **104** to approximately one hundred eighty (180) degrees. Such groove **802** can be used to limit the rotation of the speaker frame **104** anywhere from zero (0) to three hundred and sixty (360) degrees.

In other implementations of the invention the stop pin is coupled to the speaker frame flange **210** and positioned facing the frame clamp **106**. The groove may be part of the frame clamp **106**. In yet another implementation of the invention, the stop pin may be directed toward a grooved channel in the vertical wall **208** of the baffle. In yet other embodiments, the grooved channel is part of the speaker frame **104** and engages a stop pin that is part of either the baffle **102** or frame clamp **106**.

FIG. **9** illustrates a tool-less fastening system in which the speaker mounting assembly of FIG. **1** may be inserted and secured according to one embodiment of the invention. This fastening system does not require the use of hand-tools or power-tools for its installation, aside from a saw to cut the receiving hole or recess in the wall or ceiling. However, other fastening systems, including those that require tools for installation, may be used without departing from the invention.

The tool-less fastening system includes a primary mounting frame **902** and a retaining frame **904**. According to one implementation of the invention, the primary mounting frame **902** is substantially circular and defines a cavity or opening through which a speaker baffle **102** may be mounted. The primary mounting frame **902** may include a border flange **906** that may serve as an external trim once the primary mounting frame **902** is mounted within a ceiling or wall recess. The primary mounting frame also includes a plurality of posts on which the retaining frame may be coupled by a pressure fit or one or more fasteners.

The primary mounting frame **902** may also include one or more ratcheting retainers or fasteners **908**. Each ratcheting retainer **908** is movably coupled to the primary mounting frame **902**. The retaining frame is coupled to one or more posts to secure the tool-less fasteners or retainers between the primary frame **902** and retaining frame **904**. Each ratcheting retainer **908** is adapted to be manually rotated and slid to secure the primary mounting frame **902** to a mounting surface. The border flange **906** and the ratcheting retainers **908** sandwich the mounting surface to secure the primary mounting frame **902** to the mounting surface. In this manner, the primary mounting frame **902** may be installed within a recessed space with the border flange **906** substantially flush with the mounting surface.

The primary frame **902** also includes a plurality of flexible fingers **910** that help to align and secure the baffle frame **102** that is inserted into the opening. The plurality of flexible fingers **910** are inclined or disposed toward the opening of the primary mounting frame **902**.

The baffle frame **102** is configured to fit snug through the primary mounting frame opening. The fingers **910** on the primary frame **902** flex back as the baffle frame **102** is inserted into the opening.

According to one embodiment of the invention, the baffle frame **102** includes a plurality of fasteners that secure the baffle **102** to the primary mounting frame **902**. The fasteners pass from the face of the baffle **102** to the rear of the baffle to secure the baffle to the primary mounting frame **902**. The fasteners can be manually rotated to slide a securing foot over the retaining fingers **910** and secure the baffle **102** in place.

Even when the fasteners secure the baffle **102** to the primary mounting frame **902**, the baffle frame **102** can freely rotate three hundred and sixty degrees as the fastener footings slide over the retaining fingers **910**. This permits two ways in which to adjust the sound dispersion axis of a speaker mounted in a speaker frame within the baffle **102**.

First, as previously discussed, the speaker frame **104** can be rotated to adjust the angle of the sound dispersion axis of a speaker, or any other sound transducer device, mounted therein. The rotation of the speaker frame **104** relative to the baffle causes the angle of the speaker **104** to change within a certain range of angles, thus changing the angle of the sound dispersion axis of the speaker relative to the mounting surface.

Secondly, once the dispersion angle has been adjusted, the baffle **102** can be rotated relative to the primary mounting frame **902** to adjust the direction of the sound dispersion axis. Thus, sound from a speaker can be directed to a desired location within a room.

By using the angle and direction adjusting speaker frame described, a plurality of recessed speakers can be easily and quickly arranged to provide a desired sound quality in a room. For instance, a plurality of speakers may be adjusted to direct sound to a particular location in a room thus improving the sound quality at that location.

Another embodiment of the invention provides a post extension and angling system for mounting fixtures/audio devices within a recess in a wall or ceiling that can be adjusted and installed with minimal time and effort. One feature of the invention provides a post extension and angling mechanism that can be manually installed and/or adjusted to set the depth, direction and angle of an audio device so as to be able to position the sound dispersion axis of the audio device (e.g., speaker, tweeter, woofer, audio transducer, etc.) directly towards a listener.

According to one implementation of the invention, a method and system for extending the position of a ceiling-mounted tweeter to just below the ceiling surface is provided. Making the tweeter system extendable, in concert an angling system, enables the tweeter to be placed in a position that allows the listener to be directly on-axis with the tweeter, even when the listener is at an extreme angle to the speaker system. By making the tweeter system extendable, as opposed to being fixed in an extended position, the installer has the option of retaining a more conventional "flush" installation for those occasions when the installation is more aesthetically sensitive than acoustically sensitive.

FIG. **10** illustrates an extension post mechanism **1000** according to one embodiment of the invention. The extension post mechanism **1000** includes an extendable inner post **1002**, an outer post sleeve **1004**, and a post lock ring **1006**. The extendable post **1002** may include a mounting socket **1008** which may serve as a mechanical interface between an angling system to mount a ball-joint mechanism for securing an audio device (e.g., tweeter). The extendable inner post **1002** is sized to slide within the outer post sleeve **1004**. This permits an installer to set the depth of the audio device by adjusting the position of the telescoping or extendable inner post **1002** relative to the outer post sleeve **1004**. The outer post sleeve **1004** serves as the primary mechanical interface between the audio device (e.g., tweeter system) and the rest of the speaker system. The post lock ring **1006** is sized to slide snuggly around the outer post sleeve **1004** to lock the extendable inner post **1002** in place.

The extendable inner post **1002** and the outer post sleeve **1004** may be configured in a piston/cylinder arrangement that enables the extendable inner post **1002** to slide up and down inside the outer post sleeve **1004**. According to one embodiment of the invention, the amount by which the inner post **1002** may extend depends on the length of the inner post **1002** and/or outer post sleeve **1004**. For instance, in one implementation of the invention, the amount of travel allowed is sufficient to extend an audio device (e.g., tweeter) mounted on the mounting socket **1008** just below the ceiling's surface (e.g., approximately one inch) and enable "direct-axis" sound propagation to a listener positioned at an angle to the speaker system. A small amount of extension minimizes the effect on ceiling aesthetics that a non-flush grille may have. That is, by minimizing the amount by which the audio device (e.g., tweeter) protrudes beyond the surface of the ceiling, the effect of a non-flush surface is minimized.

FIG. **11** illustrates a sectional view of the extension post mechanism **1000** illustrated in FIG. **10** according to one embodiment of the invention. One aspect of the extension post mechanism **1000** may include one or more retention snap pins **1102** as part of the extendable inner post **1002** feature to secure the inner post **1002** to the outer post sleeve **1004**. The outer post sleeve **1004** includes corresponding retention slots **1104** and retention stop **1106**. The retention snap pins **1102** slide within the retention slots **1104** and are stopped by the retention stops **1106** once a maximum extension has been reached. This prevents the inner post **1002** from separating from the outer post sleeve **1004** when the lock ring **1006** is loosened.

The outer post sleeve **1004** may also be configured to be attached to a mounting mechanism. For instance, the outer post sleeve **1004** may include a base **1108** with an opening **1110** which can serve to fasten the outer post sleeve to a mounting mechanism. In one implementation of the invention, the opening **1110** may be threaded to be screwed on a fastener. Alternatively, the opening **1110** may receive a threaded fitting which can be screwed on a fastener. In another embodiment of the invention, other fastening systems or mechanism may be used to couple the outer post sleeve **1004** to a mounting mechanism without departing from the invention.

The base **1108** may also include a second opening **1112** that may serve as a passage to electrically conductive wires. For instance, the second opening **1112** may permit electrical wires to run from through the outer post sleeve **1004** and inner post **1002** to an audio device mounted on the socket **1008**.

FIG. **12** illustrates a side view of the extension post mechanism **1000** illustrated in FIG. **10** according to one embodiment of the invention. The extendable inner post **1002** includes one or more anti-rotation ribs **1202** which engage matching slots **1204** in the outer post sleeve **1004**. While the anti-rotation ribs **1202** may slide up or down within the slots **1204**, they restrict the rotation of the anti-rotation ribs **1202**. This prevents the unintended rotation of the extendable inner post **1002** relative to the outer post sleeve **1004**.

The extendable inner post **1002** may be secured at a desired position by tightening the post lock ring **1006** around the upper neck **1206** of the outer post sleeve **1004**. According to one aspect of the invention, the post lock ring **1006** and outer post sleeve **1004** include a ramp locking mechanism to tighten the lock ring **1006** around the outer post sleeve neck **1206** thereby securing the position of the inner post **1002** relative to the outer post sleeve **1004**.

FIG. **13** illustrates a sectional view of the extension post mechanism **1000** of FIG. **10** according to one embodiment of the invention. The outer post sleeve **1004** includes a retention slot **1302** around the neck **1206**. The retention slot **1302** also includes one or more ramps which gradually vary the diameter of the neck **1206**. That is, the retention slot **1302** is not perfectly circular but rather includes portions around the retention slot **1302** that gradually increase in diameter. These ramps serve to tighten the outer sleeve **1004** around the inner post **1002** when the lock ring **1006** is rotated. The diameter of the outer sleeve neck **1206** is allowed to tighten by the inward radial force exerted by the lock ring **1006** and the slots **1204** which permit the outer sleeve walls to flex inward.

The lock ring **1006** includes an internal retention ring **1304** that fits into the retention slot **1302**. The lock ring **1006** also includes one or more protruding tensioning ribs **1306** that slide against the tensioning ramps of the retention slot **1302** to gradually increase the inward force exerted on the neck **1206** of the outer sleeve **1004**. Once the lock ring **1006** is tightened around the neck of the outer sleeve **1004**, loosening of the lock ring **1006** is prevented by a plurality of tensioning lines or bumps **1208** in FIG. **12** which create friction with the tensioning ribs **1306**.

Another aspect of the invention provides a method for angling an audio device (e.g., tweeter) that may be coupled to the socket **1008**, relative to its mounting **1000**, in such a way that it may be infinitely adjustable between its un-angled position, and a maximum angle (e.g., up to fifty degrees (50°)).

In various embodiments of the invention, the extension post mechanism may be: a post that telescopes or adjusts its length by having two posts move longitudinally relative to each other to increase or decrease the overall length of the extension post mechanism, a post that may have a fixed length but can be retracted or extended relative to a reference point (e.g., a mounting surface, etc.), or any other mechanism that can be extended or retracted to place an audio device at a first side of the mounting surface, flush with the mounting surface, or on a second side of the mounting surface.

FIG. **14** illustrates a retaining and angling mechanism that may operate with an extension post mechanism according to one implementation of the invention. One embodiment of the retaining and angling mechanism includes an extendable post **1002** having a receiving socket **1008**, a rotating ball **1406** that sits on the socket **1008** in a ball-joint configuration, a device housing **1408** that is coupled to the rotating ball **1406** and a lock ring **1414** to secure the rotating ball **1406** to the socket **1008**.

According to one implementation of the invention, the socket **1008** includes grooves or split lines **1410** that permit it to expand and/or contract around the rotating ball **1406**. That is, the socket walls or edges **1412** can flex outward when the rotating ball **1406** is inserted or flex inward when the lock ring

1414 is secured around the socket edge 1412. In one implementation of the invention, the grooves or split lines 1410 extend to the inner post 1002.

The socket 1008 has a depth that is slightly more than the radius of the rotating ball 1406. The rotating ball 1406 may be pressed into the socket 1008 so that its midpoint sits just below the socket edge 1412. That is, the circumference of the rotating ball 1406 within the socket 1008 is larger than the circumference of the rotating ball outside of the socket 1008. Thus, when an inward radial force is exerted around the socket edge 1412, the rotating ball 1406 is rotationally secured within the socket 1008.

Once the rotating ball 1406 is inserted into the socket 1008 the lock ring 1414 is slid over the socket 1404 to rotationally secure the rotating ball 1406.

FIG. 15 is a sectional view of the retaining and angling mechanism in FIG. 14 according to one embodiment of the invention. In one implementation of the invention, a reverse angle retention arrangement is used to secure the lock ring 1414 around the socket neck 1502. Such reverse angle retention system may be implemented by angling the interior wall 1504 of the lock ring 1414 outward as shown and angling the exterior wall of the socket neck 1502 outward as shown. In particular, the diameter of the lower ring interior ring lock 1506 may be slightly smaller than the diameter of the upper interior lock ring 1508. Similarly, the diameter of the lower socket neck 1510 may be smaller than the diameter of the upper socket neck 1512. By making the diameter of the lower inner ring lock 1506 smaller than the diameter of the upper socket neck 1512, the lock ring is prevented from sliding off the socket neck 1502. Since the walls of the socket 1008 flex inwards and outwards, the smaller diameter of the inner ring lock 1506 can be pressed passed the larger diameter of the upper socket neck 1512.

The retention effect of the reverse angle retention system described above may be further improved by using tensioning ramps to tighten the rotating the lock ring 1414 around the socket neck 1502. According to one implementation of the invention, tension ramps 1416 and 1418 are formed along the circumference of the socket neck 1502. Similar ramps are formed along the inner circumference of the lock ring 1414. These tensioning ramps 1416 and 1420 are mating in nature, as the lock ring 1414 is rotated (e.g., clockwise), they apply an inward force to the socket neck 1502 which in turn applies an equal inward radial force upon the rotating ball 1406. The inward radial force upon the rotating ball 1406 ensures the retention of the rotating ball 1406 in the socket 1008, regardless of the ball's 1406 rotational position.

FIG. 16 illustrates a perspective sectional view of the reverse angle retention system of FIG. 14 according to one implementation of the invention. The lock ring's 1414 locking position is maintained by the interaction between lock ring tensioning ribs 1602 and socket neck bumps 1422.

According to one implementation of the reverse angle retention system, the socket 1008 includes a ledge or tabs 1514 along the outer surface of the socket 1008 that stop the lock ring 1414 from going past a desired position on the socket neck 1502.

Another aspect of the invention provides a plurality of passages through which to pass wires to and/from an audio device mounted on the device housing 1408. The device housing 1408 and rotating ball 1406 may define an opening 1604 through which one or more wires may pass. Additionally, the extendable inner post 1002 and socket 1008 also define a passage 1606 through which wires may pass to passage 1604. In this manner, an audio device mounted on the device housing 1408 may be electrically coupled to other devices.

When placed in the socket 1008, the rotating ball 1406 may be angled to a desired position. For instance, according to one implementation of the invention, the rotating ball may be angled up to fifty degrees relative to the extension mechanism 1000. The rotating ball 1406 may have a passage 1604 with a sufficiently large opening such that, when the rotating ball is angled relative to the extension mechanism 1000, the wires to the audio device passing through the passage 1604 permit the rotating ball to angle up to fifty degrees.

In concert with the post extension mechanism, these features enable the placement of an in-wall or in-ceiling audio device (e.g., speaker, woofer, tweeter, audio transducer, etc.) in such a way so as to place the listener in a "direct on-axis" position with the audio device, even when the listener is listening from the opposite end of a room relative to the speakers mounting position. That is, by placing the audio device just below the surface of the ceiling and/or angling the audio device sufficiently, the sound dispersion axis of the audio device may reach a listener directly for better sound perception.

Referring again to FIG. 9, a cross-sectional view of an audio device implementing an extendable post and angling system according to one embodiment of the invention is illustrated. A speaker device 922 may be mounted on a frame assembly 902. A sub-woofer 926 may be mounted on an extendable post system 1002, 1004, and 1006 (also illustrated in FIGS. 10-13) and on an angling socket assembly 1008, 1406, 1408, and 1414 (also illustrated in FIGS. 14-16).

As discussed above with reference to FIGS. 1-9, a first audio device 922 may be mounted in the frame assembly 902 in an angling mechanism that permits to direct the sound dispersion axis of the first audio device 922 in a desired direction.

According to one embodiment of the invention, the extendable post system 1002, 1004, and 1006 may be mounted substantially at or through the center of the first audio device 922. This setup permits mounting two or more audio devices 922 and 926 on a single frame assembly 902 or device housing. As discussed above with reference to FIGS. 10-16, the extendable post 1002 and angling mechanism permit mounting a second audio device 926 in the same frame assembly 902. The extendable post system 1002 may be adjusted to position the second audio device 926 either above, flush with, or below the mounting surface as desired. The angling system 1008, 1406, 1414 permits directing the sound dispersion axis of the second audio device 926 in a desired direction.

FIG. 17 illustrates a perspective view of an audio device system having an extension post and the retaining and angling mechanism to hold two or more audio transducer devices according to one embodiment of the invention. The frame assembly 1704 may support an audio transducer device (e.g., speaker) 1702, at an adjustable angle, while the extension post 1002 and 1004 (FIGS. 10-13) and angling socket assembly 1008, 1406, 1408, and 1414 (FIGS. 14-16) may secure a multiple-transducer housing 1704. For example, the housing 1704 may hold a tweeter 1706 and sub-woofer 1708 in one implementation of the invention. Other types of transducer devices may also be held by the housing 1704. The housing 1704 and transducer devices 1706 and 1708 may be angled and position as desired to achieve a desirable sound dispersion.

FIGS. 18, 19, 20, and 21 illustrate a recessed speaker assembly 1800 having the extension post mechanism of FIGS. 10-13 and the angling mechanism of FIGS. 14-16

according to one embodiment of the invention. The recessed speaker assembly **1800** is mounted inside an opening in a ceiling, wall, or other surface **1801** with the exposed face trim **1806** sitting substantially flush with the mounting surface **1801**. One or more audio devices **1802** and **1808** may be mounted within the recessed speaker assembly. For example, a first audio device **1808** may be a speaker or woofer, and a second audio device **1802** may be a tweeter, mid-range speaker, and/or sub-woofer.

The first audio device **1808** may be supported by a rotating angling system **1810**. The second audio device **1802** may be supported on a ball-and-socket angling system **1810** that is coupled to the telescoping post mechanism **1804**. This permits independent adjustment of the position and/or angle of the second audio device **1802** relative to the first audio device **1808**.

FIGS. **18** and **19** illustrate the telescoping post mechanism **1804** in a retracted position. As seen in the side view of FIG. **19**, when the telescoping post mechanism **1804** is in a retracted position, the audio device **1802** mounted thereon is positioned at or below the plane defined by the mounting surface **1801** (e.g., wall or ceiling) in which the speaker assembly **1800** is mounted. That is, the retracted telescoping post mechanism **1804** places the audio device **1802** below or substantially flush with the mounting surface **1801**.

FIGS. **20** and **21** illustrate the telescoping post mechanism **1804** in an extended position. The telescoping post **1804** has been extended outwards to position the audio device **1802** above the mounting surface **1801**. That is, the audio device **1802** is positioned so that it protrudes partially (e.g., one inch) or totally beyond the mounting surface **1801**. The audio device **1802** may be also be angled to achieve a desired sound dispersion axis. For example, the speaker assembly **1800** may be mounted above the ceiling surface and the audio device **1802** can be extended below the ceiling surface and angled to a desired location. In this manner, the telescoping post mechanism **1804** and angling system **1810** permit the sound dispersion axis of the audio device **1802** to be directed to any desired location without obstruction or interference from the ceiling.

In other embodiments of the invention, other mechanisms that can be extended or retracted to place an audio device at a first side of the mounting surface (e.g., above the mounting surface), flush with the mounting surface, or on a second side of the mounting surface (e.g., below the mounting surface) may be employed without departing from the invention.

FIGS. **18-21** also illustrates the first audio device **1808** at an angle to the mounting surface **1801**. The first audio device **1808** is mounted on a frame **104** (in FIG. **1**) that rotates against the baffle **102**. The telescoping post mechanism **1804** and angling system **1810** may be supported by the structure of the first audio device **1808** and/or the frame **104**.

FIGS. **22**, **23**, **24**, and **25** illustrate a recessed speaker assembly **1800** having the extension post mechanism **1804** of FIGS. **10-13** and the angling mechanism **1810** of FIGS. **14-16** for multiple audio devices **2204** and **2206** according to one embodiment of the invention. Instead of the single audio device housing of FIGS. **18-21**, FIGS. **22-25** illustrate an example of a multiple device housing **2202** that may serve to house multiple audio devices **2204** and **2206** according to one embodiment of the invention. The multiple device housing **2202** includes a ball mounting to couple to the same or similar socket **1406** (FIG. **14**) used by the single audio device housing illustrated in FIGS. **14-16**.

The multiple device housing **2202** enables mounting more audio devices **2204** and **2206** in a single speaker location. For example, the multiple device housing **2202** can enable mounting two or more tweeters, mid-range speakers, and/or sub-woofers, or a combination thereof, on a single post extension **1804** and angling mechanism **1810**.

FIGS. **22** and **23** illustrate the speaker assembly **1800** in a substantially retracted position. That is, the telescoping post mechanism **1804** is minimized so that the audio device housing **2202** is positioned at, near, or below the plane defined by the mounting surface **1801** (e.g., wall or ceiling) in which the speaker assembly **1800** is mounted. That is, the retracted telescoping post mechanism **1804** places the audio device **1802** below or substantially flush with the mounting surface **1801**. FIG. **23** illustrates a side view of the audio devices **2204** and **2206** positioned near the mounting surface **1801**.

FIGS. **24** and **25** illustrate the telescoping post mechanism **1804** in an extended position with the angling system **1810** at an angled position. The telescoping post **1804** has been extended outwards to position the audio devices **2204** and **2206** above the mounting surface **1801**. That is, the audio devices **2204** and **2206** are positioned so that they protrude partially (e.g., one inch) or totally beyond the mounting surface **1801**. The audio devices **2204** and **2206** may be also be angled to achieve a desired sound dispersion axis. For example, the speaker assembly **1800** may be mounted above the ceiling surface and the audio devices **2204** and **2206** can be extended below the ceiling surface and angled to a desired location. In this manner, the telescoping post mechanism **1804** and angling system **1810** permit the sound dispersion axis of the audio devices **2204** and **2206** to be directed to any desired location without obstruction or interference from the ceiling.

The described telescoping post **1804** and angling system **1810** of the present invention can direct the sound dispersion axis of the audio devices as desired (e.g., without obstruction and/or interference from the mounting surface) while maintaining a low profile that is more aesthetically pleasing. For example, the audio devices may be positioned just below the ceiling surface, at a desired angle, so that they have a minimal effect on the aesthetics of the environment in which the recessed speaker mechanism is mounted.

Various embodiments of the invention may be implemented using parts, fasteners, frames, baffles, etc., constructed from one or more materials, or combination of material, including plastic, metal, polymers, and/or any other material.

The audio device(s) illustrated in FIGS. **1-25** may be installed by inserting an audio device housing or frame assembly into a recessed cavity so that the audio device housing is on a first side of a mounting surface. The audio device housing sits substantially flush with the mounting surface. The audio device housing is then secured in the recess cavity. The depth of a first audio device coupled to the audio device housing is adjusted so that the first audio is mounted either substantially flush with, or on a second side of, the mounting surface. The angle of the first audio device is then adjusted to direct its sound dispersion axis to a desired location. The angle of a second audio device coupled to the audio device housing is adjusted to direct its sound dispersion axis to a desired location. The angle of the second audio device being independently adjustable from the angle of the first audio device.

While certain exemplary embodiments have been described and shown in the accompanying drawings, it is to be understood that such embodiments are merely illustrative of and not restrictive on the broad invention, and that this invention not be limited to the specific constructions and arrangements shown and described, since various other modifications are possible. Those skilled in the art will appreciate

that various adaptations and modifications of the just described embodiments can be configured without departing from the scope and spirit of the invention. Therefore, it is to be understood that, within the scope of the appended claims, the invention may be practiced other than as specifically described herein.

What is claimed is:

1. A device for recessed installations, comprising:

a housing configured to be installed on a first side of a mounting surface in a cavity opening defined by the mounting surface;

a first audio device mounted inside the housing, the first audio device positioned at the mounting surface or on the first side of the mounting surface;

an adjustable post coupled to the housing, the adjustable post including a first post and a second post that move relative to one another to increase or decrease the length of the adjustable post; and

a second audio device coupled to the telescoping post such that it moves longitudinally with the adjustable post as the adjustable post length is increased or decreased; wherein the second audio device can be selectively positioned on the first side of the mounting surface, substantially flush with the mounting surface, and on a second side of the mounting surface by adjusting the length of the adjustable post.

2. The device of claim **1** further comprising:

an angling device coupled to the adjustable post and the second audio device to permit angling the second audio device to be directed along a desired sound dispersion axis.

3. The device of claim **2** wherein the angling device includes a ball-joint socket and ball coupler, wherein the ball coupler is sized to fit within the ball-joint socket, the ball coupler and ball-joint socket capable of rotating relative to each other, and a lock ring is sized to fit around the circumference of the ball-joint socket to tighten the ball-joint socket around the ball coupler, and wherein the ball-joint socket includes one or more tensioning ramps along circumference of the ball-joint socket, when the lock ring is rotated around the circumference of the ball-joint socket an inward radial force is exerted to secure the ball coupler at a particular position.

4. The device of claim **1** further comprising:

an angling mechanism coupled to the housing and the first audio device that permits angling the first audio device relative to the mounting surface.

5. The device of claim **1** further comprising:

a third audio device coupled to the telescoping post such that it can be positioned on the first side of the mounting surface, substantially flush with the mounting surface, and on the second side of the mounting surface by decreasing or increasing the length of the adjustable post.

6. The device of claim **1** wherein the adjustable post is mounted substantially at the center of the first audio device.

7. A device for recessed installations, comprising:

a housing configured for installation on a first side of a mounting surface in an opening defined by the mounting surface;

an adjustable post coupled to the housing; and

a first audio device coupled to the adjustable post such that the first audio device can be selectively positioned on the first side of the mounting surface, substantially flush with the mounting surface, and on a second side of the mounting surface by adjusting the adjustable post.

8. The device of claim **7** wherein the first audio device can also be positioned on the first side of the mounting surface by adjusting the adjustable post.

9. The device of claim **7** wherein adjusting the adjustable post includes increasing or decreasing the length of the adjustable post.

10. The device of claim **7** wherein adjusting the adjustable post includes retracting or extending the adjustable post relative to the mounting surface.

11. The device of claim **7** further comprising:

a second audio device mounted within the housing, the second audio device positioned flush with the mounting surface or on the first side of the mounting surface.

12. A system for mounting audio devices within a cavity, comprising:

a housing configured for installation on a first side of a mounting surface;

a telescoping assembly coupled to the housing; and

a first audio device coupled to the telescoping assembly such that the first audio device can be selectively positioned on the first side of the mounting surface, substantially flush with the mounting surface, and on a second side of the mounting surface by adjusting the telescoping assembly.

13. The system of claim **12** wherein the first audio device can also be positioned on the first side of the mounting surface by adjusting the length of the telescoping assembly.

14. The system of claim **12** further comprising:

a second audio device coupled to the housing, the second audio device positioned adjacent to the mounting surface or on the first side of the mounting surface,

an angling device coupled to the telescoping assembly and the first audio device to permit angling the first audio device to be directed along a desired sound dispersion axis.

15. The system of claim **12** further comprising:

an angling device coupled to the telescoping assembly and the first audio device to permit angling the first audio device to be directed along a desired sound dispersion axis, the angling device including

a ball-joint socket,

a ball coupler sized to fit within the ball-joint socket, the ball coupler capable of rotating within the ball-joint socket, and

a lock ring sized to fit around the circumference of the ball-joint socket and tighten the ball-joint socket around the ball coupler.

16. The system of claim **15** wherein the angling device is capable of being angled up to approximately fifty degrees in any direction relative to a perpendicular axis of the mounting surface.

17. The system of claim **15** further comprising:

a third audio device coupled to the telescoping assembly such that it can be positioned on the first side of the mounting surface, substantially flush with the mounting surface, or the second side of the mounting surface by decreasing or increasing the length of the telescoping assembly.

18. The system of claim **15** wherein the telescoping assembly includes

an inner post,

an outer sleeve configured to slide longitudinally along the inner post, and

a first lock ring sized to fit around the circumference of the first end of outer sleeve to tighten the outer sleeve around the inner post and secure telescoping assembly at a desired position.

19. An audio device comprising:

housing means configured for installation on a first side of a mounting surface;

telescoping means coupled to the housing means; and

a first audio device coupled to the telescoping means such that the first audio device can be selectively positioned on the first side of the mounting surface, substantially flush with the mounting surface and on a second side of the mounting surface by adjusting the telescoping means.

20. A method of mounting a recessed audio device, comprising:

inserting an audio device housing into a recessed cavity so that the audio device housing is on a first side of a mounting surface, the audio device housing sitting substantially flush with the mounting surface;

securing the audio device housing in the recess cavity; and

adjusting the depth of a first audio device coupled to the audio device housing so that it is selectively mounted on the first side of the mounting surface, substantially flush with the mounting surface, and on a second side of the mounting surface.

21. The method of claim 20, further comprising:

adjusting the angle of the first audio device to direct its sound dispersion axis to a desired location;

adjusting the angle of a second audio device coupled to the audio device housing to direct its sound dispersion axis to a desired location, the angle of the second audio device being independently adjustable from the angle of the first audio device.

* * * * *