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(19) **United States**(12) **Patent Application Publication**
Landon(10) **Pub. No.: US 2007/0161346 A1**(43) **Pub. Date: Jul. 12, 2007**(54) **SECURITY CAGE FOR VENT PIPES****Publication Classification**(76) Inventor: **Phillip Landon**, Hanover Park, IL (US)(51) **Int. Cl.**
F24F 7/00 (2006.01)(52) **U.S. Cl.** **454/339**(57) **ABSTRACT**

The present invention provides a security cage for use with a vent pipe. The security cage comprises a screen member having a generally circular flange portion being integrally connected with a generally hemispherical body portion. The screen member is formed from a plurality of rigid wires intersecting one other in a cross-cross arrangement and engaged with each other at their points of intersection so as to retain the hemispherical shape of the body and the circular shape of the flange. An air flow baffle may be used in combination with the security cage.

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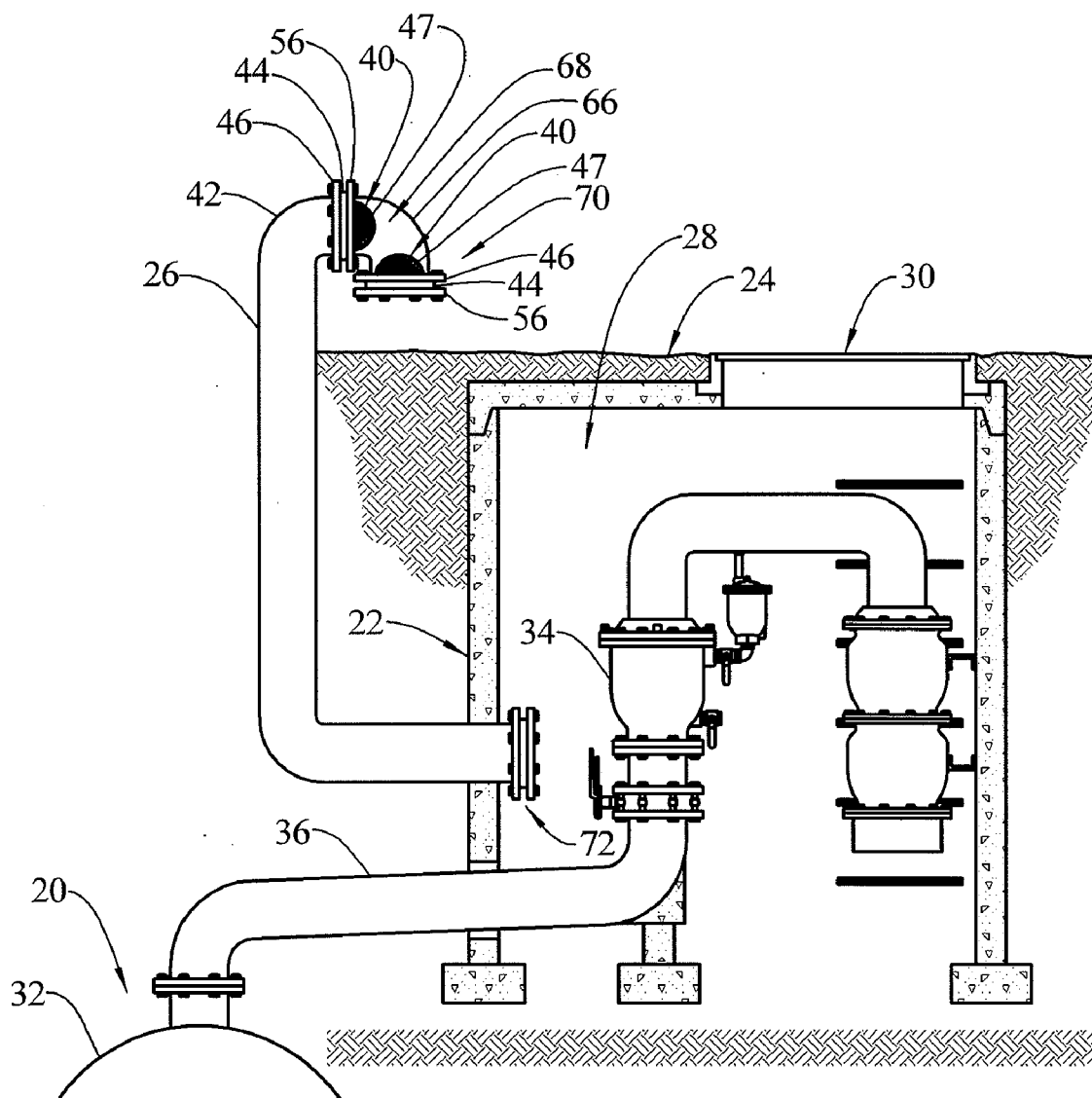
(21) Appl. No.: **11/328,585**(22) Filed: **Jan. 10, 2006**

FIG. 1

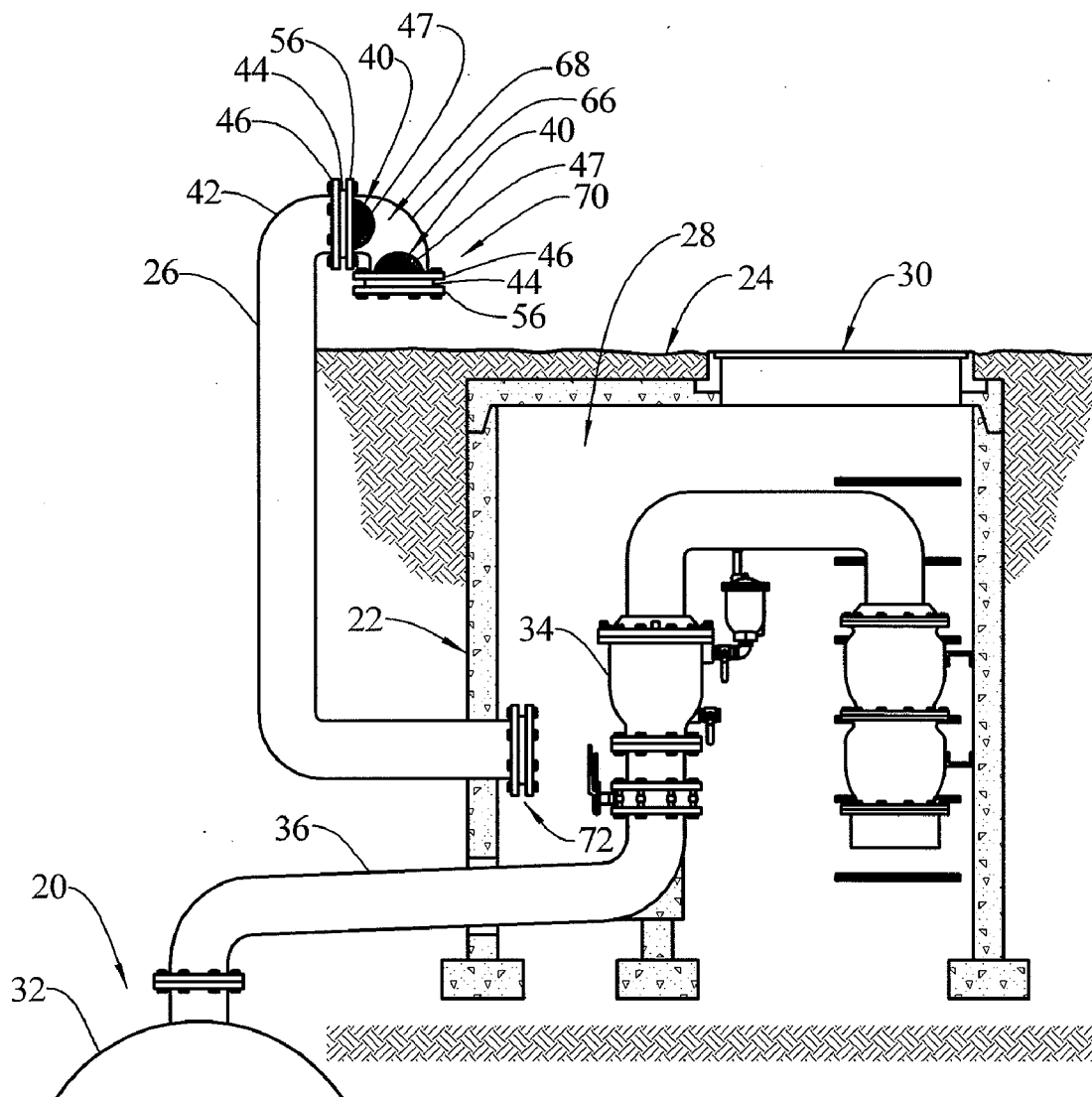


FIG. 2

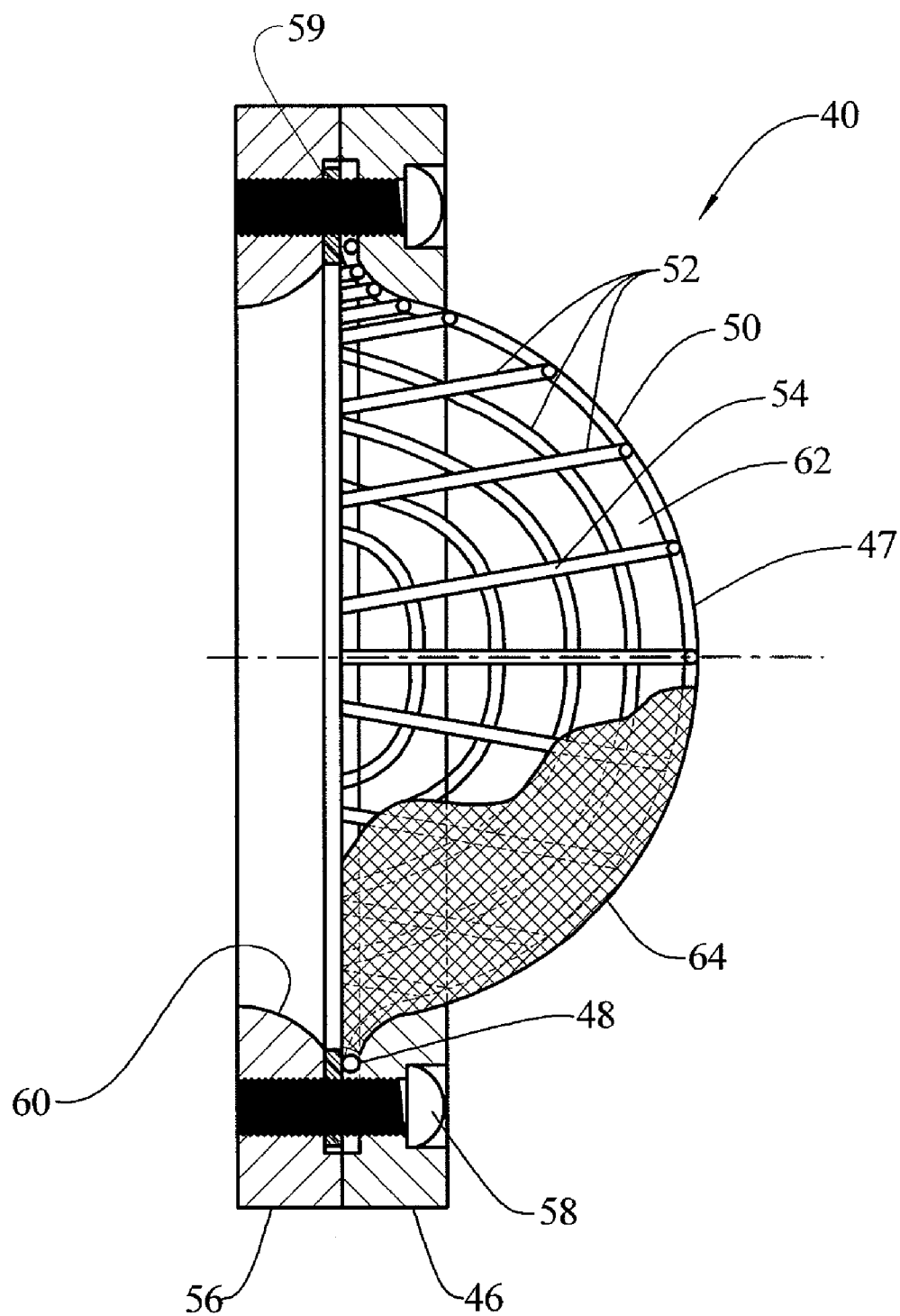


FIG. 3

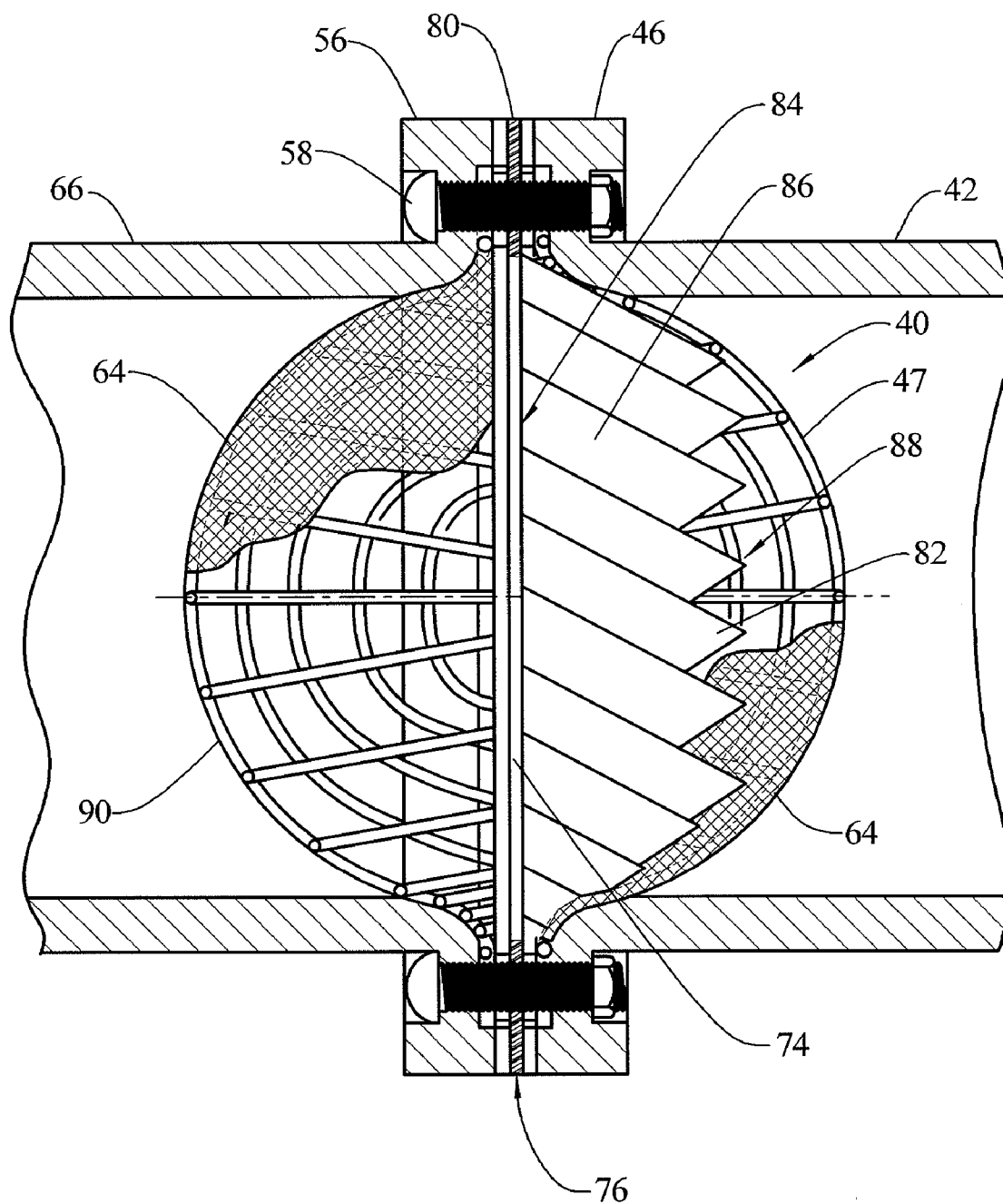


FIG. 5

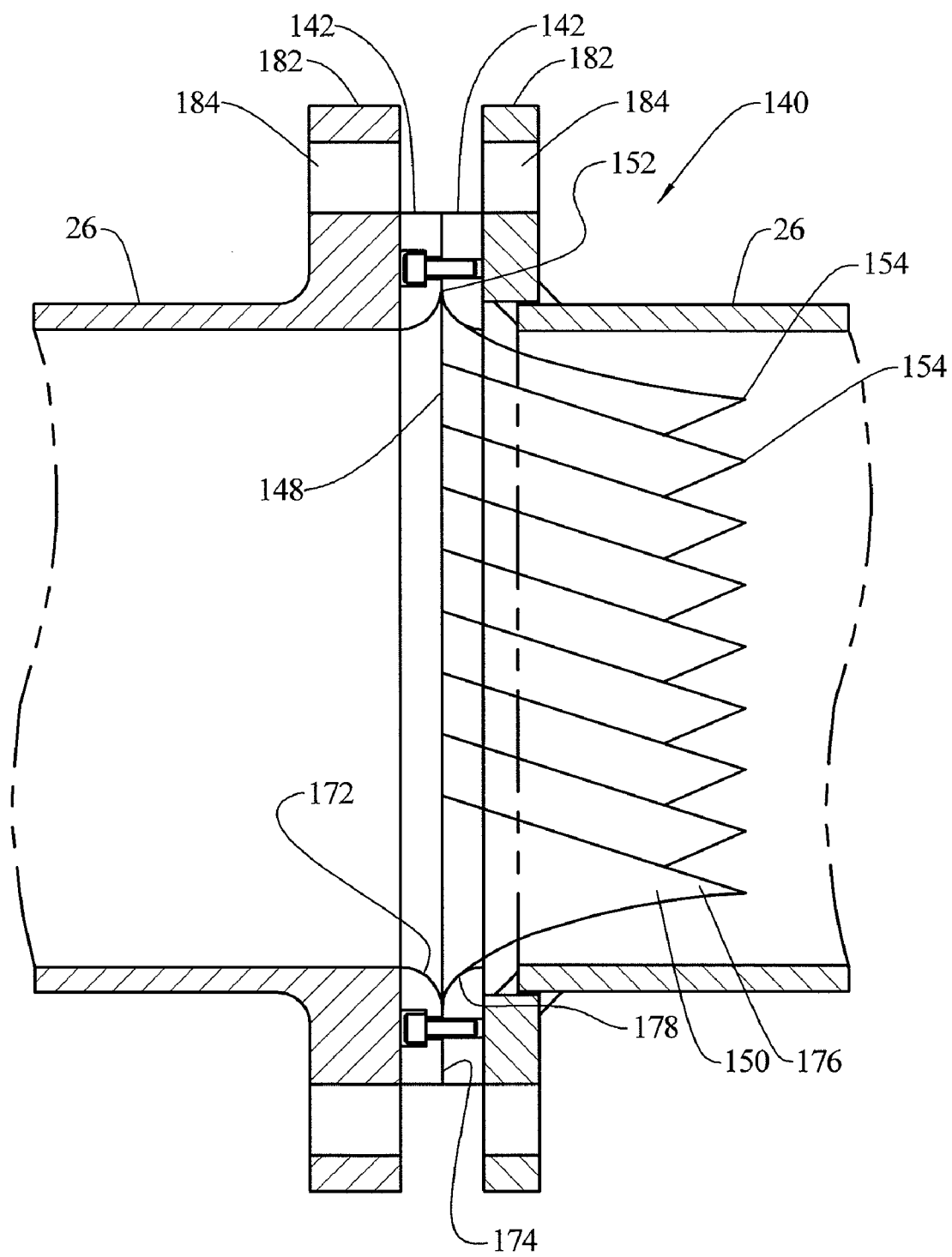


FIG. 6

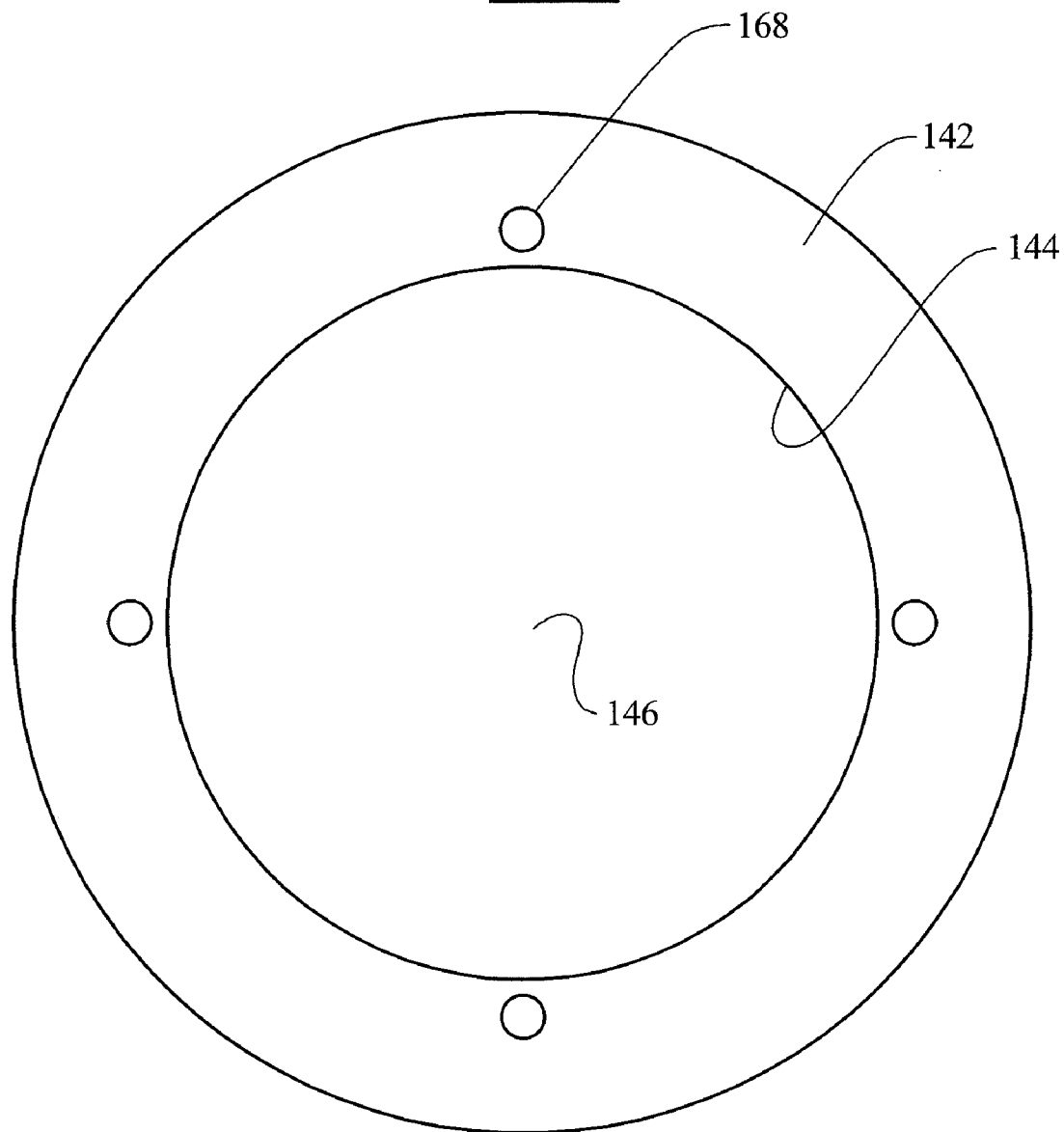


FIG. 7

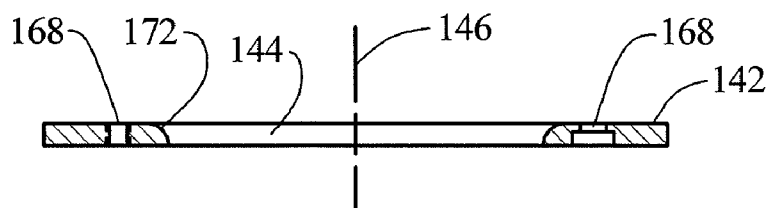


FIG. 8

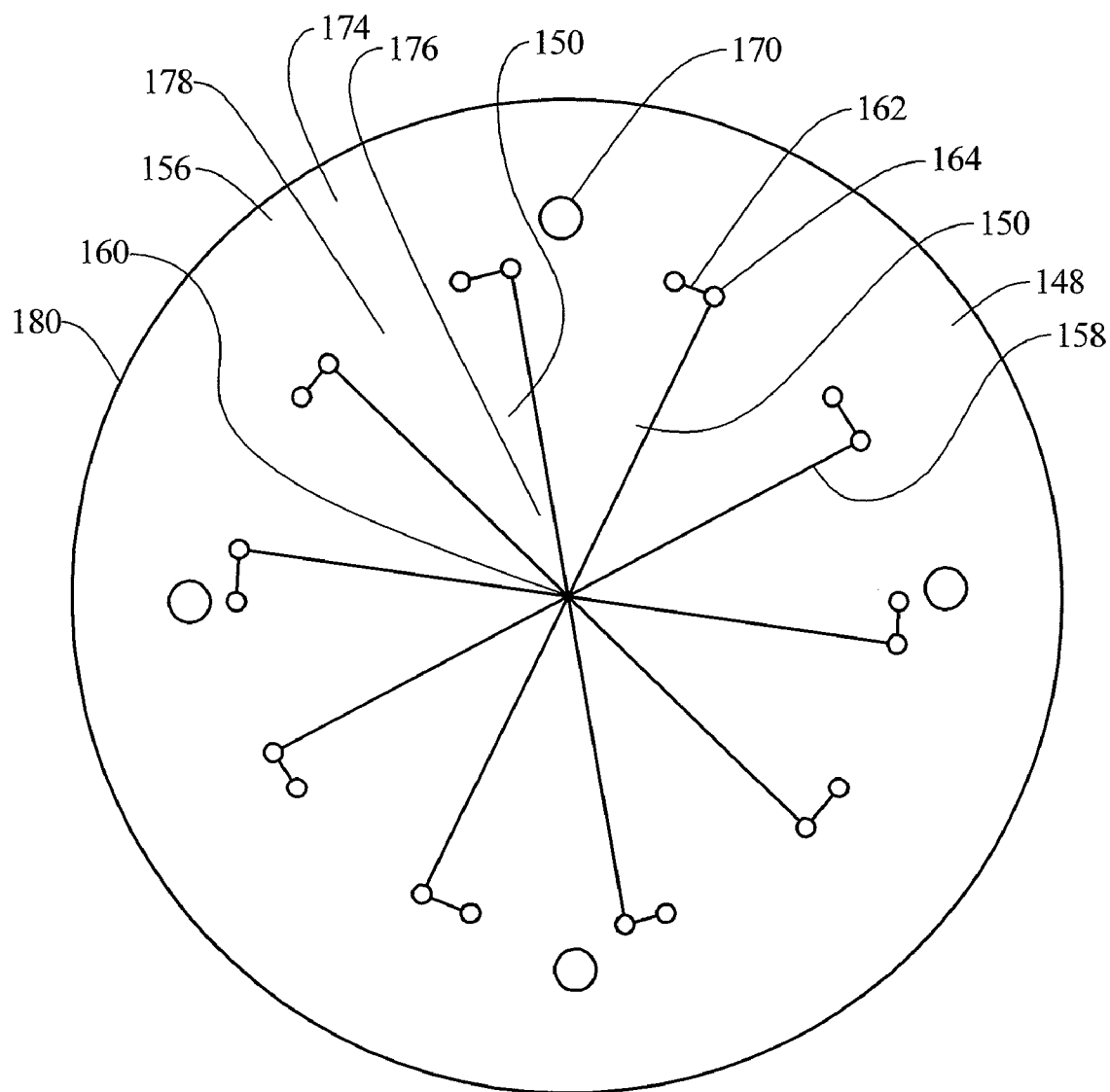


FIG. 9

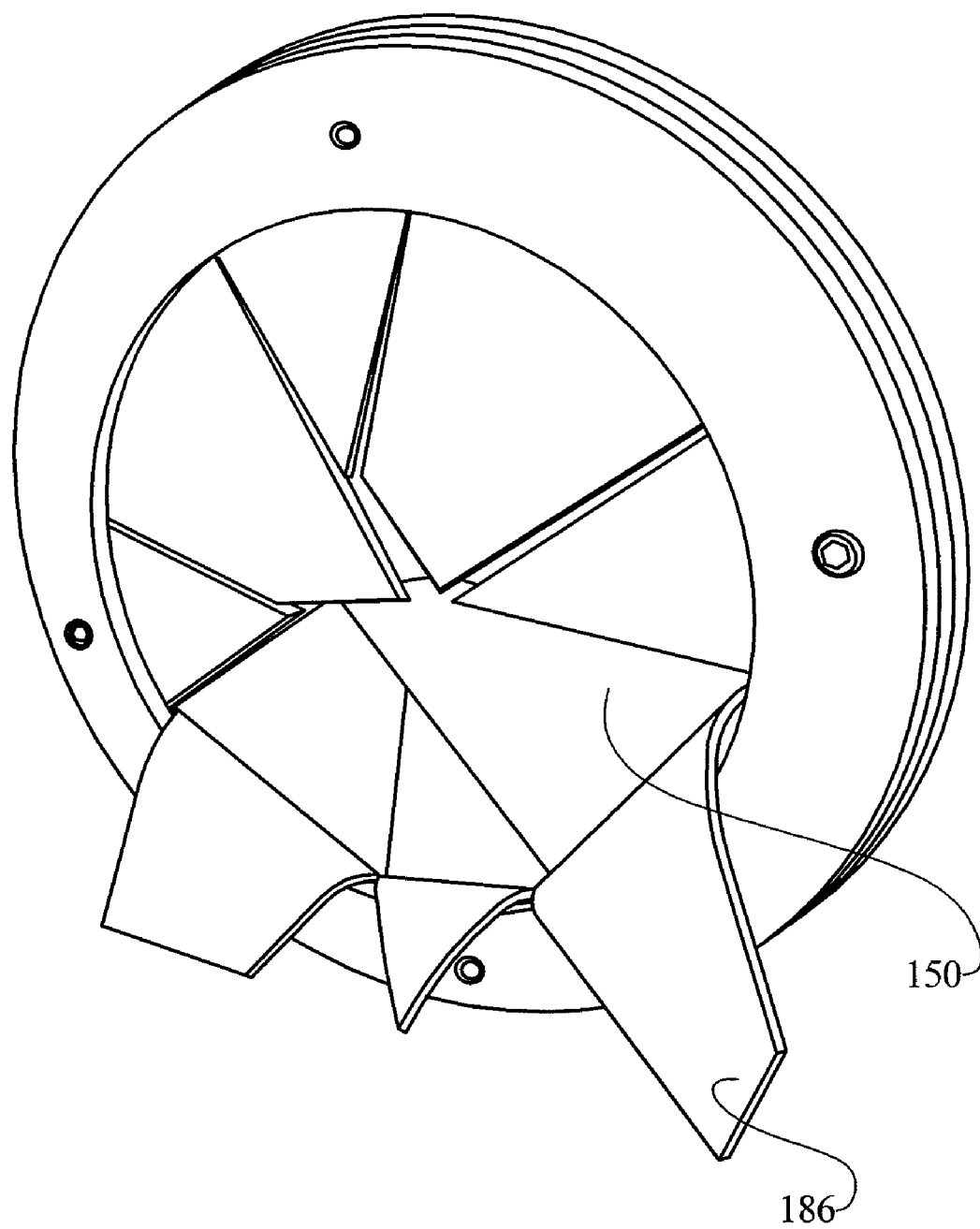


FIG. 10

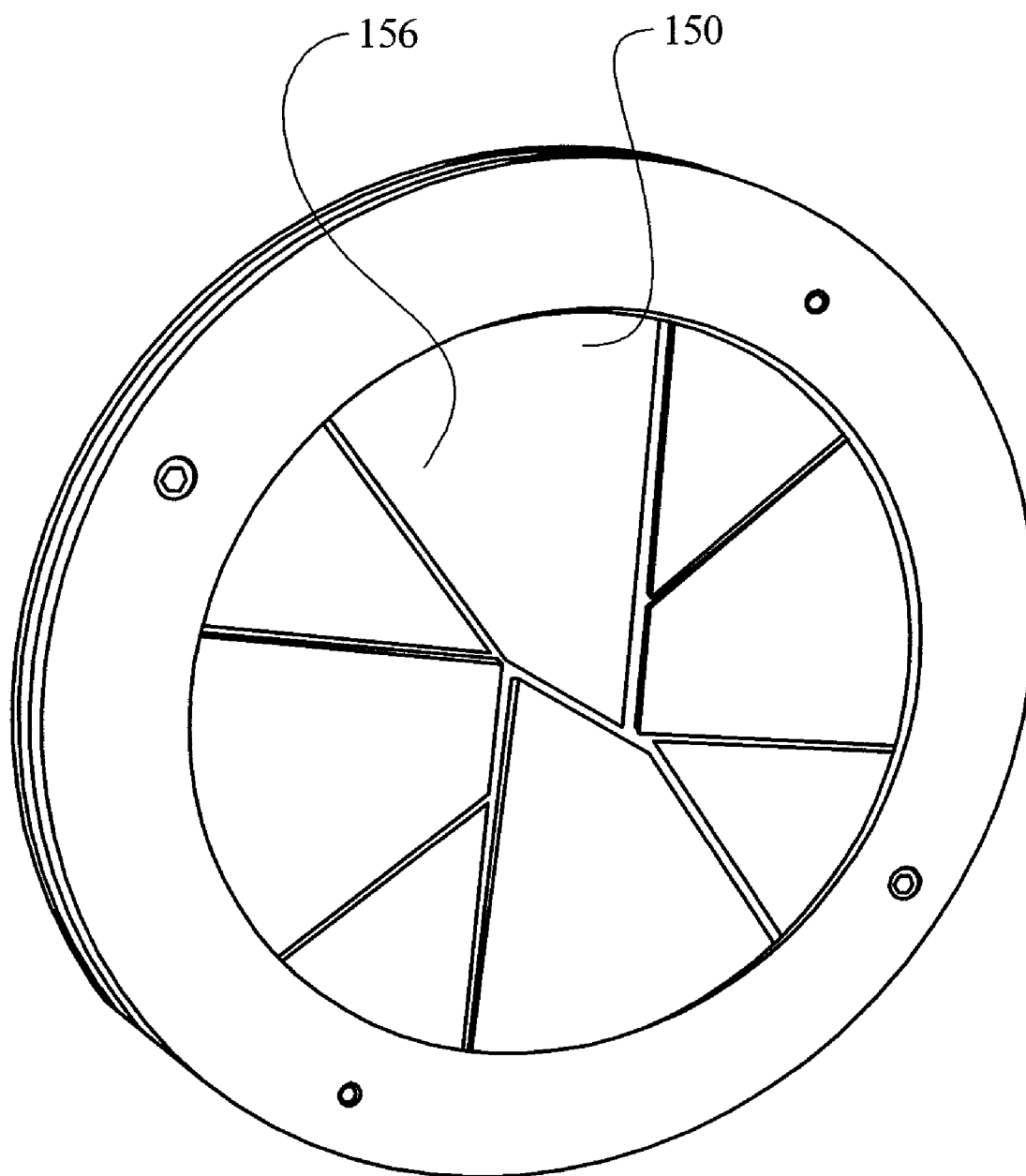


FIG. 11

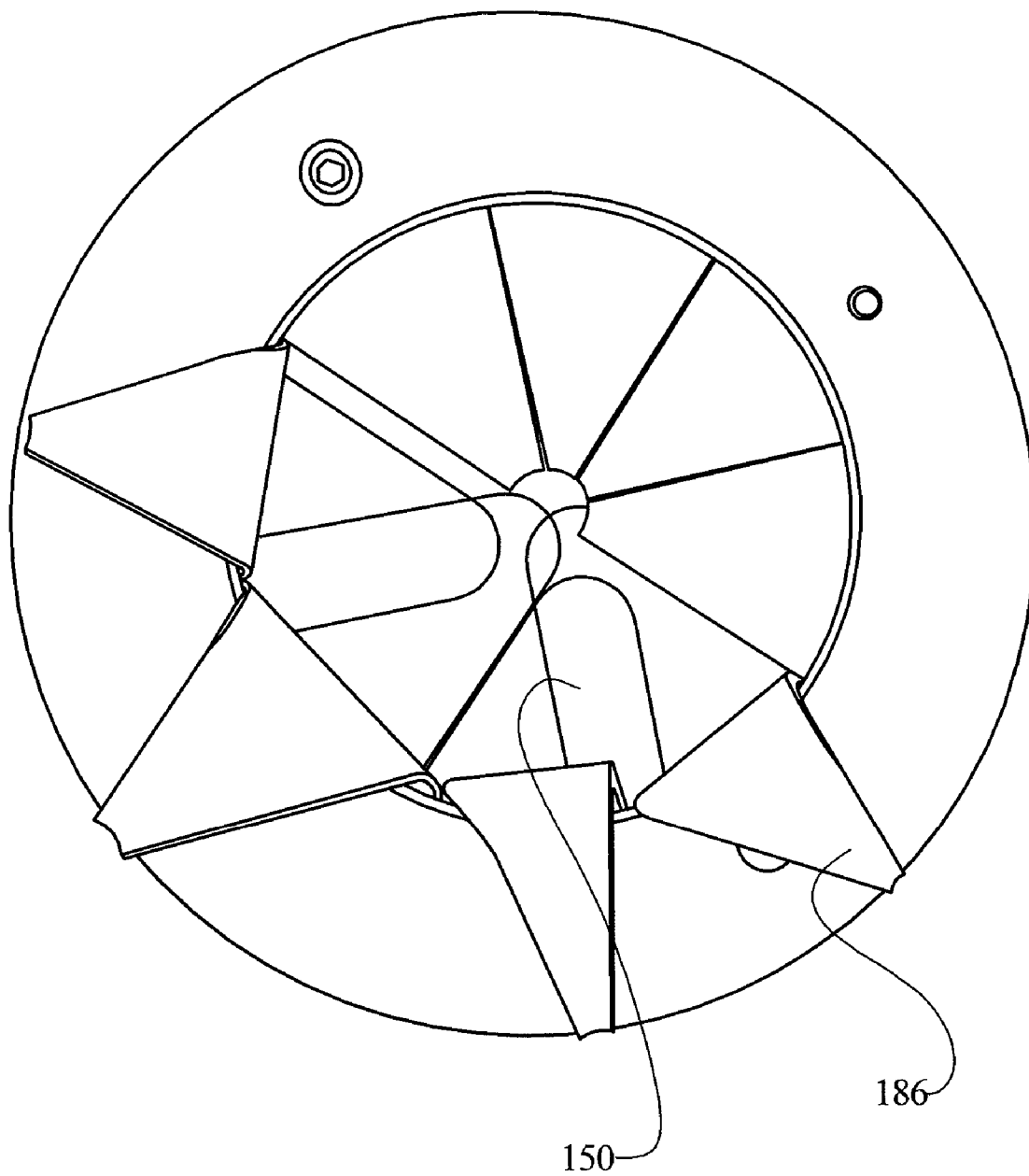


FIG. 12

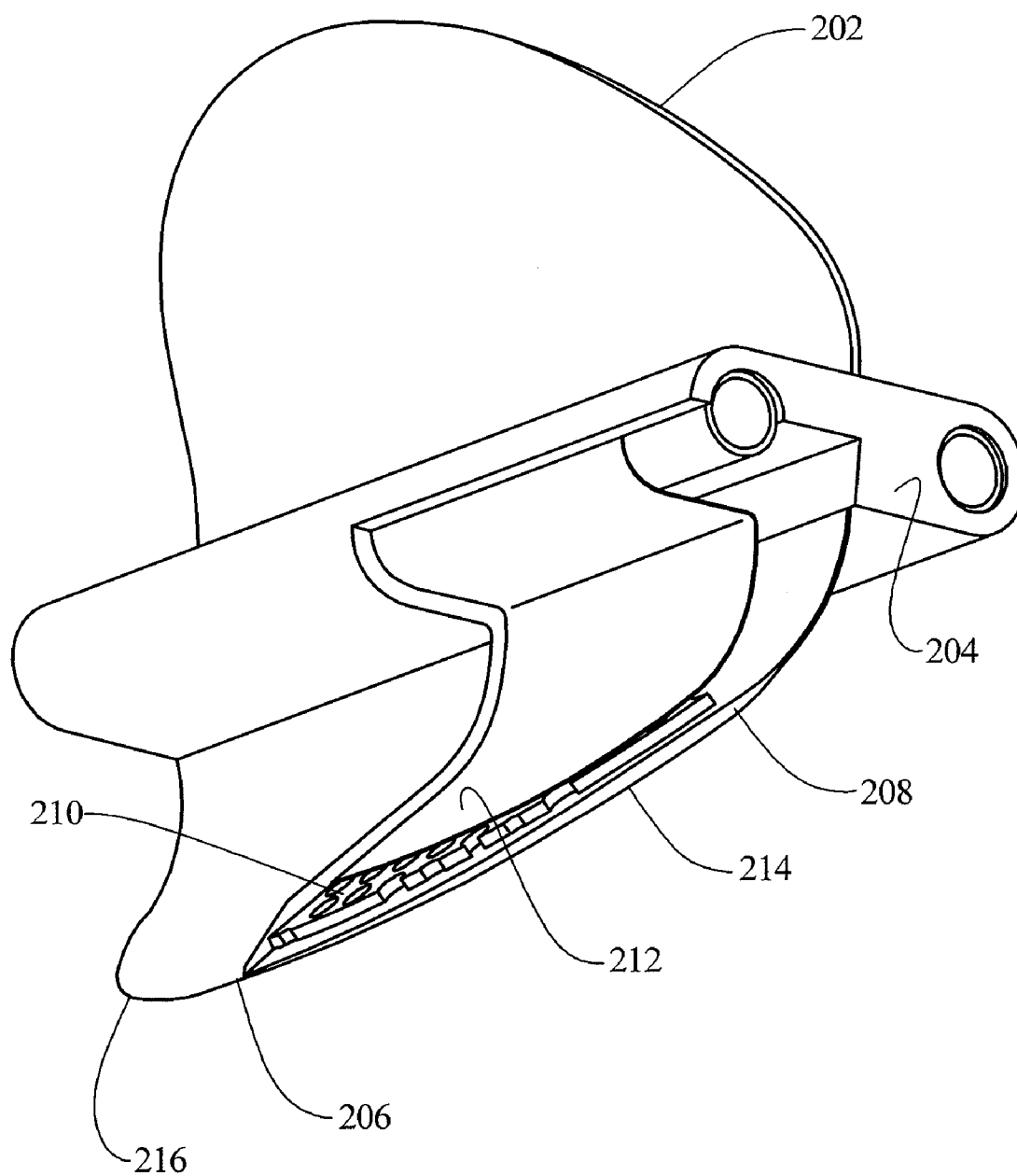


FIG. 13

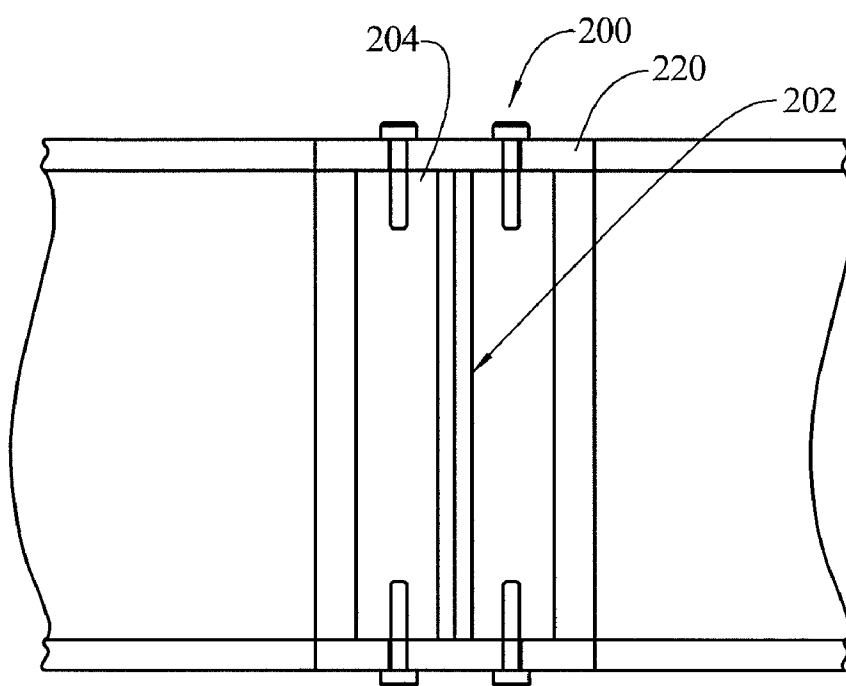


FIG. 14

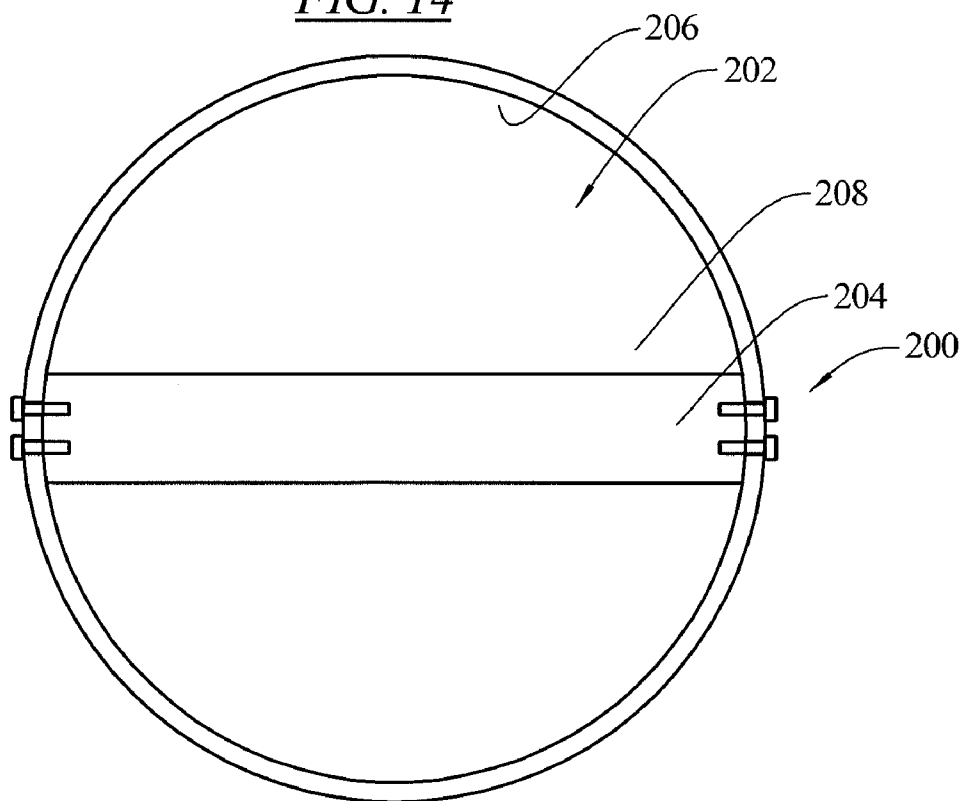


FIG. 15

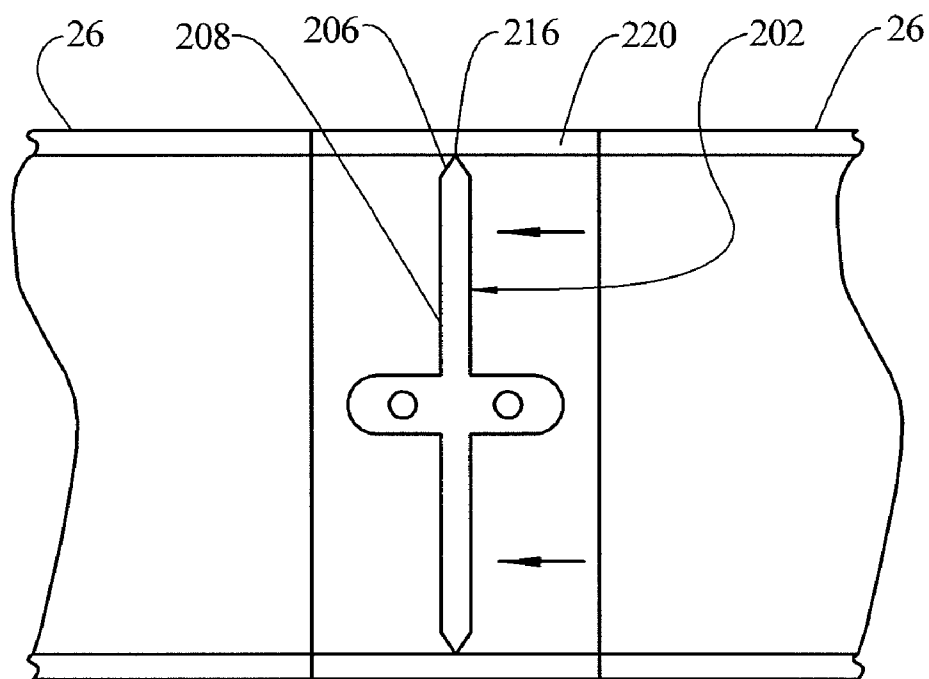
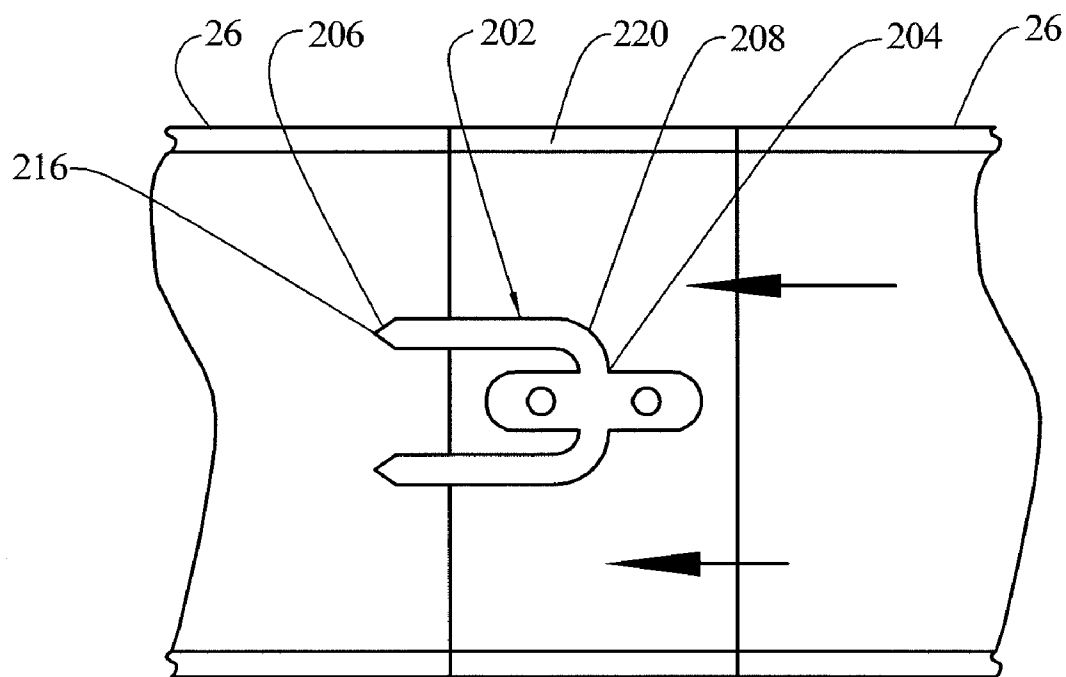


FIG. 16



SECURITY CAGE FOR VENT PIPES

BACKGROUND OF THE INVENTION

[0001] The present invention generally relates to venting, exhaustion and/or admission of air in piping systems. More specifically, the present invention relates to a security screen arrangement for an air vent pipe.

[0002] Venting systems are used with air valves to prevent vacuum conditions within a liquid pipeline, and to allow for exhaust or purging of gases from the liquid carried in the pipeline. In the case of an underground pipeline, such as used with potable water systems or waste or ground water systems, oftentimes the vent connections occur in underground vaults and reservoirs, which themselves need to be vented to the atmosphere. Vent pipes are also used in other situations where air needs to be exhausted or introduced into various areas or spaces such as ground level reservoirs.

[0003] Typical security screens used in connection with vent pipes comprise flat mesh screen placed across the open ends of vent pipes, and held in place with exterior bands or clamps, or other fastening arrangements. Such arrangements have drawbacks in that the flat surface has an open area limited generally to the cross-sectional area of the pipe less the area of the screen wires, which may become substantially covered with debris, reducing the available area for the free flow of air into or out of the vent pipe.

[0004] Also, having merely a screen provides a limited security measure which might be readily defeated, such as by a person who intentionally seeks to introduce hazardous materials, such as a liquid, in that a small diameter tube might be introduced through the openings in the security screen when no additional security barrier is provided.

SUMMARY OF THE INVENTION

[0005] The present invention provides a security cage for use with a pipeline, wherein the vent pipe includes a pipe end with a flange. The security cage comprises a screen member having a generally circular flange portion sized to overlie the pipe end flange and surrounds and is integrally connected with a generally hemispherical body portion. The screen member is formed from a plurality of rigid wires intersecting one other in a cross-cross arrangement and engaged with each other at their points of intersection so as to retain the hemispherical shape of the body and the circular shape of the flange. A second flange member is sized to overlie the pipe end flange, with the screen member flange sandwiched therebetween. A plurality of bolts are arranged to threadingly engage with at least one of the flanges to clampingly secure the screen member between the pipe end flange and the second flange.

[0006] In an embodiment, the flanges have a curved interior opening complementary to a contour of the screen member body.

[0007] In an embodiment, the cross-cross arrangement of wires provides a defined opening size for the screen member and further includes a mesh coving the screen member having a smaller opening size than the screen member.

[0008] In an embodiment, the second flange comprises a flange from another pipe member such that the screen member is interposed along a length of a vent pipe.

[0009] In an embodiment, the second flange is solely a flange, such that the screen member is attached at an end of the vent pipe.

[0010] In an embodiment, the body is arranged such that the hemispherical shape of the screen member extends inwardly at the end of the vent pipe.

[0011] In an embodiment, a two-way damper is positioned between the screen member and the pipe flange.

[0012] In an embodiment, the two-way damper comprises a baffle comprising a flexible member with a first portion secured and held in a fixed position by the flanges and a second portion normally oriented in a first position, but free to move relative to the first position, a third portion, arranged between the first and second portions being flexible and resilient and allowing the second portion to move to a second position relative to the first position upon the application of a pressure differential across the baffle above a threshold pressure and causing the second portion to return to the first position upon the application of a pressure differential across the baffle below the threshold pressure.

[0013] In an embodiment, a second screen member is arranged such that the first and second screen members are sandwiched between the two flanges and the two-way damper is sandwiched between the screen members.

[0014] In an embodiment, a security arrangement for an air vent pipe is provided wherein the vent pipe is comprised of two pipes joined together at their ends, with each pipe end including a flange surrounding the pipe end for connecting to the other pipe end. The security arrangement comprises a first screen member having a generally circular flange portion sized to overlie one of the pipe end flanges and surrounding and being integrally connected with a generally hemispherical body portion which extends into the pipe end whose flange the first screen member overlies, the screen member being formed from a plurality of rigid wires intersecting one other in a criss-cross arrangement and engaged with each other at their points of intersection so as to retain the hemispherical shape of the body and the circular shape of the flange. A second screen member is included having a generally circular flange portion sized to overlie the other one of the pipe end flanges and surrounding and being integrally connected with a generally hemispherical body portion which extends into the pipe end whose flange the second screen member overlies, the screen member being formed from a plurality of rigid wires intersecting one other in a criss-cross arrangement and engaged with each other at their points of intersection so as to retain the hemispherical shape of the body and the circular shape of the flange. An air flow damper, which may be a two-way damper, is positioned between the first screen member and the second screen member.

[0015] In an embodiment, the two-way damper comprises a baffle comprising a flexible member with a first portion secured and held in a fixed position by the flanges and a second portion normally oriented in a first position, but free to move relative to the first position, a third portion, arranged between the first and second portions being flexible and resilient and allowing the second portion to move to a second position relative to the first position upon the application of a pressure differential across the baffle above a threshold pressure and causing the second portion to return

to the first position upon the application of a pressure differential across the baffle below the threshold pressure.

[0016] In an embodiment, the flanges have a curved interior opening complementary to a contour of the screen member bodies.

[0017] In an embodiment, the criss-cross arrangement of wires provides a defined opening size for the screen members and further including a mesh coving at least one of the screen members having a smaller opening size than the screen member.

[0018] In an embodiment, a security cage is provided for use with a vent pipe. The security cage comprises a screen member having a generally circular flange portion being integrally connected with a generally hemispherical body portion. The screen member is formed from a plurality of rigid wires intersecting one other in a criss-cross arrangement and engaged with each other at their points of intersection so as to retain the hemispherical shape of the body and the circular shape of the flange.

[0019] Other details of embodiments of the present invention are illustrated in the drawings and described below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] FIG. 1 illustrates a cross-sectional view of a liquid pipeline system including a vent and security system embodying the principles of the present invention.

[0021] FIG. 2 illustrates a cross-sectional view of an embodiment of a single security cage of the present invention mounted on a vent pipe.

[0022] FIG. 3 illustrates a cross-sectional view of an embodiment of two security cages used in conjunction with a two-way damper shown in an open position in a vent pipe.

[0023] FIG. 4 illustrates a cross-sectional view of an embodiment of the damper system of the present invention in a closed position.

[0024] FIG. 5 illustrates a cross-sectional view of the embodiment of FIG. 4 in an open position.

[0025] FIG. 6 illustrates an end elevational view of a retaining ring used in the embodiment of FIG. 4.

[0026] FIG. 7 illustrates a side sectional view of the retaining ring of FIG. 6.

[0027] FIG. 8 illustrates an end elevational view of a baffle used in the embodiment of FIG. 4.

[0028] FIG. 9 illustrates an end elevational view of an assembled damper system with a modification of the embodiment of FIG. 4.

[0029] FIG. 10 illustrates an end elevational view of an assembled damper system with another modification of the embodiment of FIG. 4.

[0030] FIG. 11 illustrates an end elevational view of an assembled damper system with a further modification of the embodiment of FIG. 4.

[0031] FIG. 12 illustrates a perspective view of another embodiment of a baffle used with the damper system of the present invention.

[0032] FIG. 13 illustrates a side sectional view of the embodiment of the damper system using the baffle of FIG. 12.

[0033] FIG. 14 illustrates an end sectional view of the damper system of FIG. 13.

[0034] FIG. 15 illustrates a side sectional view of the damper system of FIG. 13 taken at 90 degrees from the view of FIG. 13, and in the closed position.

[0035] FIG. 16 illustrates a side sectional view of the damper system of FIG. 13 taken at 90 degrees from the view of FIG. 13, and in the open position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0036] As shown in FIG. 1, and in greater detail in FIG. 2, the present invention provides a security cage 40 for use with a vent pipe 42, wherein the pipe includes a pipe end 44 with a flange 46. The security cage 40 comprises a screen member 47 having a generally circular flange portion 48 sized to overlie the pipe end flange 46 and surrounds and is integrally connected with a generally hemispherical body portion 50. The screen member 47 is formed from a plurality of rigid wires 52 intersecting one other in a criss-cross arrangement and engaged with each other at their points of intersection 54 so as to retain the hemispherical shape of the body portion 50 and the circular shape of the flange portion 48. The wires 52 may be secured together, such as by welding, or may be held together by friction, such as if the wires are woven into the screen shape. The wires 52 may have a circular cross section, or may have other shapes, such as a square, rectangular or oval cross section. A second flange member 56 is sized to overlie the pipe end flange 46, with the screen member flange portion 48 sandwiched therebetween. A plurality of bolts 58 are arranged to threadingly engage with at least one of the flanges 46, 56 to clampingly secure the screen member 47 between the pipe end flange and the second flange. A gasket 59 may also be provided between the screen member flange portion 48 and the second flange 56 to assist in securing the security cage 40 in place.

[0037] The hemispherical shape of the body portion 50 provides a greater surface area for the screen member 47 than is provided when a security screen is merely stretched across a diameter of a pipe opening, thereby allowing for a greater air flow to enter or exit the pipeline, particularly when the screen is partially covered with debris.

[0038] In an embodiment, the flanges 46, 56 have a curved interior opening 60 shaped complementary to a contour of the screen member body portion 50.

[0039] In an embodiment, the criss-cross arrangement of wires 52 provides a defined size for openings 62 in the screen member 47. The security cage 40 further includes a mesh 64 covering the screen member 47 which has a smaller opening size than the screen member. The mesh 64 may be used when it is desired to prevent objects smaller than the size of the openings 62 from entering the vent pipe 42. In some installations, the mesh 64 may not be required. The screen member 47 provides support for the mesh 64, which may be made of a relatively light material.

[0040] In an embodiment, the second flange member 56 comprises a flange from another pipe member 66 such that

the screen member 47 is interposed along a length of a pipe as shown at location 68 in FIG. 1.

[0041] In an embodiment, the second flange member 56 is solely a flange, such that the screen member 66 is attached at an end of the vent pipe 42 as shown at locations 70, 72 in FIG. 1.

[0042] In an embodiment, the body portion 50 is arranged such that the hemispherical shape of the screen member 47 extends inwardly at the end of the vent pipe 42 as shown at location 70.

[0043] In an embodiment as illustrated in FIG. 3, a two-way damper 74 is positioned between the screen member 47 and the pipe flange 46. This two-way damper 74 will normally close the vent pipe 42, and hence provide a passive barrier to air flow, as well as to the introduction of other fluids by unauthorized persons. While many different constructions of dampers 74 may be utilized, including one-way dampers as well as other two-way dampers, the dampers disclosed in U.S. patent application Ser. No. 11/256,787, filed Oct. 24, 2005, incorporated herein by reference, may be effectively used with the security cage 40 of the present invention.

[0044] In an embodiment, the two-way damper 74 comprises a baffle 76 comprising a flexible member with a first portion 80 secured and held in a fixed position by the flanges 46, 56 and a second portion 82 normally oriented in a first position 84, but free to move relative to the first position, a third portion 86, arranged between the first and second portions being flexible and resilient and allowing the second portion to move to a second position 88 relative to the first position upon the application of a pressure differential across the baffle above a threshold pressure (as shown in FIG. 3) and causing the second portion 82 to return to the first position 84 upon the application of a pressure differential across the baffle 74 below the threshold pressure.

[0045] In an embodiment as illustrated in FIG. 3, a second screen member 90 (which is identical to screen member 47) is arranged such that the first and second screen members are sandwiched between the two flanges 46, 56 and the two-way damper 74 is sandwiched between the screen members. The mesh 64 may be provided over one or both screen members 47, 90 as needed.

[0046] The hemispherical shape of the screen member 47 allows full movement of the second 82 and third 86 portions of the baffle 76, so that restriction of the movement of air in the vent pipe 42 is minimized when the baffle is in the open position. By providing a screen member 47, 90 on both sides of the baffle 76, the baffle will be protected against debris moving in either direction in the pipeline. In some installations, there may be no chance of debris on the interior side of the vent pipe, and so the second screen member 90 may be omitted when using the baffle

[0047] Referring back to FIG. 1, although the vault 22 is positioned below ground level 24, since the vent pipe 26 allows outside air into the interior 28 of the vault, the interior of the vault would be subject to below freezing temperatures if there were a free flow of air into the interior of the vault through the vent pipe. In order to prevent such free flow of air, yet allow for venting of the pipeline 32 and to avoid vacuum formation in the pipeline, a two-way damper 140 is provided in the vent pipe 26. This two-way damper 140 may

be positioned in a horizontal portion of the vent pipe 26 as shown, or may be positioned in a vertical portion of the vent pipe, or arranged at any angle, without detracting from the operation of the damper, as explained below. This two-way damper will prevent a free flow of air into or out of the interior 28 of the vault 22, unless a certain threshold pressure differential exists between the interior of the vault and normal atmospheric pressure. When such a threshold pressure does exist, such as when the air valve 34 is actually admitting air into the pipeline 32 or allowing air to exhaust from the pipeline, then the damper 140 will allow for air to freely flow through the damper, as needed. The two-way damper may be constructed in various different embodiments, two of which are described in detail below.

[0048] In FIGS. 4-8 a first embodiment of the two-way damper 140 is illustrated as being positioned in the vent pipe 26. In this embodiment, the two-way damper 140 includes a retaining ring 142 having an open center 144 with a centerpoint 146. The two-way damper 140 also includes a valve member 148 having a plurality of flexible and resilient leaves 150 arranged around the ring 142 and each having a fixed proximal end 152 secured to the retaining ring and a free distal end 154 located substantially at the centerpoint 146 of the ring. The leaves 150 are movable relative to each other and are arranged such that substantially the entire open center 144 of the ring 142 is occupied by the leaves. FIG. 4 shows the leaves 150 in a normally closed position when the pressure differential across the valve member 148 is below a threshold pressure level, and FIG. 5 shows the leaves in an open position when the pressure on the left side of the valve member 148 is greater than the pressure on the right side of the valve member, by an amount greater than the threshold pressure level. In such a situation, the leaves 150 flex into the open position and allow the passage of air from left to right in a virtually unhindered manner. The damper 140 works exactly the same in the opposite direction when the pressure is exerted from the opposite side.

[0049] The plurality of leaves 150 may be formed in a single disk of material 156, such as a thin flexible plastic material, as shown in isolation in FIG. 8, or two or more disks may be stacked on one another in a face to face arrangement. In a particular embodiment, the plurality of leaves 150 are formed in two overlying disks 156. The leaves 150 are formed by radial slits 158 in the disk 156, leading from a centerpoint 160 of the disk and extending radially outward towards the ring 142. The leaves 150 have an angular slit 162 which extends from each radial slit 158, in one angular direction, substantially perpendicular to the radial slit, at an end 164 of the radial slit adjacent to the ring 142. A junction point between the angular slit 162 and the radial slit 158 may include a relief cut out, in the form of a circle to prevent tearing of the material adjacent to the slits. An end of the angular slit 162 may also be provided with such a relief cut out.

[0050] As illustrated in FIG. 4, the disk 156 or disks may be sandwiched between two retaining rings 142 and held in place with threaded fasteners 166 which extend through openings 168 in the rings and openings 170 in the disks. Half of the openings 168 in the rings 142 may be internally threaded so that separate retaining fasteners, such as nuts, will not be required. The open center 144 of the ring 142 may be defined by a radiused edge 172 to allow the leaves 150 to bend over the edge as shown in FIG. 5, without a

sharp edge which might concentrate bending stress that could damage the disks **156** or the leaves. The radiused edge **172** also is sized to allow an entire cord of the base of a triangle of the leaves **150** to remain on the radius, which provides greater air flow through the damper **140** when the leaves are in the open position as shown in FIG. 5.

[0051] In a particular embodiment, the plurality of leaves **150** may be formed in two overlying disks **156** which are identical to each other, as shown in FIG. 8, formed with the radial slits **158** leading from the centerpoint **160** of the disks and extending towards the ring, each radial slit terminating at the angular slit **162** which extends a quarter of the way towards an adjacent radial slit. Each disk **156** has a top face and a bottom face, and the top faces are arranged to face each other by flipping one disk over relative to the other disk. The disks **156** are then rotated relative to one another around the centerpoint **160** to overlap adjacent leaves **150** relative to one another. An edge of each leaf **150** is inserted into a radial slit **158** in the other disk to overlap and interleave the two disks, and the radial slits **162**, each extending a quarter of the way towards the next adjacent radial slit, will allow the leaves to overlap half way with each other. In this manner, each adjacent leaf **150** in the assembled two disks **156** will be from alternating disks. This type of construction has been demonstrated to provide resiliency to the flexible leaves **150**, so that when the pressure differential across the disks **156** drops below the threshold pressure, the leaves will return to their normal position, blocking the vent pipe **26**, and preventing any ambient flow of air through the vent pipe from natural convection.

[0052] The disks **156** may be made of a thin flexible material that has some resiliency, such as a plastic material like mylar, a high durometer rubber, or spring steel. When the leaves **150** are moved to their open position as shown in FIG. 5, the opening has the shape of a flow nozzle which provides a low head loss across the damper system **140**. The open center **144** should have generally the same diameter as the internal diameter of the vent pipe **26**.

[0053] Thus, this first embodiment provides a two-way damper **140** comprising a retaining member in the form of the ring **142** and a baffle in the form of the valve member **148**, the baffle comprising a flexible member in the form of the disk **156** with a first portion **174** of the baffle secured and held in a fixed position by the retaining member and a second portion **176** normally oriented in a first position, but free to move relative to the first position, a third portion **178**, arranged between the first and second portions being flexible and resilient and allowing the second portion to move to a second position relative to the first position upon the application of a pressure differential across the baffle above a threshold pressure and causing the second portion to return to the first position upon the application of a pressure differential across the baffle below the threshold pressure. The flexible member **156** is secured and held stationary at an outer periphery **180** thereof, and along the entire outer periphery thereof.

[0054] Further, this first embodiment provides a two-way damper **140** comprising a combination of the baffle **148** and the retaining member **142**, the baffle comprising the generally circular flexible member **156** with the first portion **174**, at a portion of the periphery **180** of the member, secured and held in a fixed position by the retaining member, the second portion **176** spaced from the retaining member normally oriented in the first position, but free to move relative to the

first position, and the third portion **178**, arranged between the first and second portions, being flexible and resilient and allowing the second portion to move to the second position relative to the first position upon the application of a pressure differential across the baffle above the threshold pressure and causing the second portion to return to the first position upon the application of a pressure differential across the baffle below the threshold pressure. The retaining member **142** comprises the ring and the baffle is secured at its entire periphery to the ring.

[0055] The two-way damper **140** may be secured in the vent pipe **26**, such as by flanges **182** formed on or welded to the ends of the vent pipe, with threaded fasteners, such as bolts (not shown) extending through openings **184** in the flanges serving to clamp the damper in the vent pipe. The rings **142** may be made of a plastic material or a light weight metal in that there is no need for strength or heavy duty structure for the rings since they remain stationary and may be sandwiched between the flanges in the vent pipe **26**.

[0056] A modification of the first embodiment of the two-way damper is essentially the same as the first embodiment except that a ring-shaped gasket with an outside diameter of the same size as the periphery **180** and an inside diameter falling just outside of the ends of the slits **162** is inserted between two disks **156** to give a curvature to the leaves **150** giving them additional stiffness. This has been found to extend the life of the disks **156** and leaves **150** when they are constructed of a plastic material and to reduce any noise caused by resonances of the leaves with the air flowing over them when the damper is in the open position.

[0057] Another modification of the first embodiment, as illustrated in FIG. 9, is to sandwich single or multiple disk(s) **156** between two sheets of thin resilient material **186**, such as a reinforced rubber material, which are slit in the same manner and along the same lines as the closing disk **156**. Portions of the resilient material **186** are shown pulled back in FIG. 9 to permit viewing of the disk **156**. The resilient material **186** provides the function of 1) thermal insulation and 2) protection of the mylar disk **156** from abrasion when the disk strikes the walls of rough vent pipes.

[0058] Further modifications of the first embodiment, as illustrated in FIGS. 10 and 11, are to cut the disks **156** so that the leaves **150** are of different lengths (FIG. 10) and/or have rounded ends (FIG. 11) to lower resonance and reduce damage to the leaves, particularly when they are made of a plastic material such as mylar. When the leaves **150** have different lengths, there may not be a common meeting point for all of the leaves in that some leaves extend to or beyond the centerpoint **146** of the ring **142**, while other leaves stop short of the centerpoint. In the case where the leaves **150** have rounded ends, all of the leaves may stop short of the centerpoint, or some of the leaves may extend to the centerpoint or beyond. If all of the leaves **150** stop short of the centerpoint, and if resilient material **186** is used, the resilient material may be cut so that its leaves all reach the centerpoint, or nearly so, such that substantially all of the opening interior of the disk is closed off by the disk **156** or the resilient material.

[0059] Another embodiment of the two-way damper **140** is illustrated in FIGS. 12-16. In this embodiment, the two-way damper **140** comprises a retaining member **200** which may include one or more threaded fasteners, and a baffle **202**. The baffle **202** comprises a flexible member with a first portion **204** secured and held in a fixed position by the retaining member **200** and a second portion **206** normally

oriented in a first position (FIG. 15), but free to move relative to the first position. The baffle 202 also comprises a third portion 208, arranged between the first 204 and second 206 portions being flexible and resilient and allowing the second portion to move to a second position (FIG. 16) relative to the first position upon the application of a pressure differential across the baffle above a threshold pressure and causing the second portion to return to the first position upon the application of a pressure differential across the baffle below the threshold pressure.

[0060] In this embodiment, the baffle 202 is a circular disk of flexible, yet resilient material, and may comprise a composite or lamination of different materials. For example, the baffle 202 may have an inner core 210 of a relatively rigid metal plate, such as a perforated aluminum plate layer to provide stiffness. This core 210 may be covered by another layer 212, such as a nylon fabric layer as a reinforcement for the baffle 202. Finally, the outer surface 214 may be made of a rubber material that is flexible. The entire combination or composite will be both flexible and resilient, allowing the baffle 202 to deflect as shown in FIG. 16 to permit the passage of air in pressure differentials above the threshold pressure level and to return to a normal configuration (FIG. 15) to block any flow of ambient air when the pressure differential is below the threshold pressure level. An edge 216 of the baffle that engages or abuts the surrounding pipe 126 may be tapered to have a very thin thickness, such as a knife edge, in order to reduce the amount of surface area contact between the baffle and the surrounding pipe, in order to reduce friction and to reduce the possibility of frost or ice buildup along the edge which might prevent or hamper operation of the damper in cold conditions.

[0061] A central hub portion 218 may be provided for receiving the retaining member 200 which secures and holds the baffle 202 stationary at an outer periphery of the baffle. As illustrated, this embodiment may have the baffle 202 in the form of a generally circular disk and which is secured and held stationary at two end points of a chord of the disk. If the hub 218 is positioned symmetrically on the baffle 202, as shown, the chord comprises a diameter of the disk. When the retaining member 200 is in the form of a threaded fastener, or similar fastener, two such fasteners may be provided at each end of the chord where the baffle is secured in order to prevent the baffle from rotating in the pipe. The retaining member 200 may also include a ring of rigid material 220, such as a length of conduit, which may be secured within the vent pipe 26 by any number of known attachment methods.

[0062] Thus, this embodiment provides a two-way damper comprising a combination of the baffle 202 and the retaining member 200. The baffle 202 comprises a generally circular flexible member with a first portion 204, at a portion of a periphery of the member, secured and held in a fixed position by the retaining member 200, the second portion 206 spaced from the retaining member normally oriented in a first position (FIG. 12), but free to move relative to the first position, and the third portion 208, arranged between the first and second portions, being flexible and resilient and allowing the second portion to move to a second position relative to said first position (FIG. 13) upon the application of a pressure differential across the baffle above a threshold pressure and causing the second portion to return to the first position upon the application of a pressure differential across the baffle below the threshold pressure. The retaining member 200 may comprise the ring of rigid material 220 and a

mechanical fastening element extending between the ring and the baffle at two or more points around the periphery of the baffle. The ring of rigid material 220 may comprise a conduit and the mechanical fastening element may comprise a threaded fastener extending through the conduit and into the baffle.

[0063] It should be understood that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modifications may be made without departing from the spirit and scope of the present invention and without diminishing its attendant advantages. It is, therefore, intended that such changes and modifications be covered by the appended claims.

1. A security cage for use with a vent pipe, wherein said vent pipe includes a pipe end with a flange, said security cage comprising:

a screen member having a generally circular flange portion sized to overlie said pipe end flange and surrounding and being integrally connected with a generally hemispherical body portion,

said screen member being formed from a plurality of rigid wires intersecting one other in a criss-cross arrangement and engaged with each other at their points of intersection so as to retain said hemispherical shape of said body and said circular shape of said flange,

a second flange member sized to overlie said pipe end flange, with said screen member flange sandwiched therebetween, and

a plurality of bolts arranged to threadingly engage with at least one of said flanges to clampingly secure said screen member between said pipe end flange and said second flange.

2. A security cage according to claim 1, wherein said flanges have a curved interior opening complementary to a contour of said screen member body.

3. A security cage according to claim 1, wherein said criss-cross arrangement of wires provides a defined opening size for said screen member and further including a mesh covering said screen member having a smaller opening size than said screen member.

4. A security cage according to claim 1, wherein said second flange comprises a flange from another pipe member such that said screen member is interposed along a length of a vent pipe.

5. A security cage according to claim 1, wherein said second flange is solely a flange, such that said screen member is attached at an end of said vent pipe.

6. A security cage according to claim 5, wherein said body is arranged such that said hemispherical shape of said screen member extends inwardly at said end of said vent pipe.

7. A security cage according to claim 1, and including a two-way damper positioned between said screen member and said pipe flange.

8. A security cage according to claim 7, wherein said two-way damper comprises a baffle comprising a flexible member with a first portion secured and held in a fixed position by said flanges and a second portion normally oriented in a first position, but free to move relative to said first position, a third portion, arranged between said first and second portions being flexible and resilient and allowing said second portion to move to a second position relative to

said first position upon the application of a pressure differential across said baffle above a threshold pressure and causing said second portion to return to said first position upon the application of a pressure differential across said baffle below said threshold pressure.

9. A security cage according to claim 7, including a second screen member arranged such that said first and second screen members are sandwiched between said two flanges and said two-way damper is sandwiched between said screen members.

10. A security arrangement for an air vent pipe wherein the vent pipe is comprised of two pipes joined together at their ends, with each pipe end including a flange surrounding the pipe end for connecting to the other pipe end, said security arrangement comprising:

a first screen member having a generally circular flange portion sized to overlie one of said pipe end flanges and surrounding and being integrally connected with a generally hemispherical body portion which extends into said pipe end whose flange said first screen member overlies, said screen member being formed from a plurality of rigid wires intersecting one other in a criss-cross arrangement and engaged with each other at their points of intersection so as to retain said hemispherical shape of said body and said circular shape of said flange,

a second screen member having a generally circular flange portion sized to overlie the other one of said pipe end flanges and surrounding and being integrally connected with a generally hemispherical body portion which extends into said pipe end whose flange said second screen member overlies, said screen member being formed from a plurality of rigid wires intersecting one other in a criss-cross arrangement and engaged with each other at their points of intersection so as to retain said hemispherical shape of said body and said circular shape of said flange, and

an air flow damper positioned between said first screen member and said second screen member.

11. A security cage according to claim 10, wherein said air flow damper comprises a two-way damper.

12. A security cage according to claim 11, wherein said two-way damper comprises a baffle comprising a flexible member with a first portion secured and held in a fixed position by said flanges and a second portion normally oriented in a first position, but free to move relative to said first position, a third portion, arranged between said first and second portions being flexible and resilient and allowing said second portion to move to a second position relative to said first position upon the application of a pressure differential across said baffle above a threshold pressure and causing said second portion to return to said first position upon the application of a pressure differential across said baffle below said threshold pressure.

13. A security cage according to claim 10, wherein said flanges have a curved interior opening complementary to a contour of said screen member bodies.

14. A security cage according to claim 10, wherein said criss-cross arrangement of wires provides a defined opening size for said screen members and further including a mesh

covering at least one of said screen members having a smaller opening size than said screen member.

15. A security cage for use with a vent pipe, said security cage comprising:

a screen member having a generally circular flange portion being integrally connected with a generally hemispherical body portion,

said screen member being formed from a plurality of rigid wires intersecting one other in a criss-cross arrangement and engaged with each other at their points of intersection so as to retain said hemispherical shape of said body and said circular shape of said flange.

16. A security cage according to claim 15, wherein said criss-cross arrangement of wires provides a defined opening size for said screen member and further including a mesh covering said screen member having a smaller opening size than said screen member.

17. A security cage for use with a vent pipe, wherein said vent pipe includes a pipe end with a flange, said security cage comprising:

a screen member having a flange portion integrally connected with a generally hemispherical body portion,

said screen member being formed from a plurality of rigid wires intersecting one other in a criss-cross arrangement and engaged with each other at their points of intersection so as to retain said hemispherical shape of said body portion,

a second flange member sized to overlie said pipe end flange, with said screen member flange engaged by said second flange member, and

a plurality of bolts arranged to threadingly engage with at least one of said flanges to capture said screen member at said pipe end flange by said second flange.

18. A security cage according to claim 17, wherein said second flange member is formed separately from said screen member.

19. A security cage for use with a vent pipe, wherein said vent pipe includes a pipe end with a flange, said security cage comprising:

a screen member having a flange portion connected to a generally hemispherical body portion,

said body portion being formed from a plurality of rigid wires intersecting one other in a criss-cross arrangement and engaged with each other at their points of intersection so as to retain said hemispherical shape of said body portion,

said flange portion sized to overlie said pipe end flange, and

a plurality of bolts arranged to engage with said flange portion to capture said security cage at said pipe end flange by said flange portion.

20. A security cage according to claim 19, wherein said flange portion is comprised of a flange formed partially from said wires and partially from a different material.

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