



US 20040016190A1

(19) **United States**

(12) **Patent Application Publication**

Radke et al.

(10) **Pub. No.: US 2004/0016190 A1**

(43) **Pub. Date: Jan. 29, 2004**

(54) **MODULAR DEVICE TO CREATE A
PASSAGE THROUGH A PARTITION**

Publication Classification

(51) **Int. Cl.⁷ E04B 1/92**

(52) **U.S. Cl. 52/232; 52/220.8**

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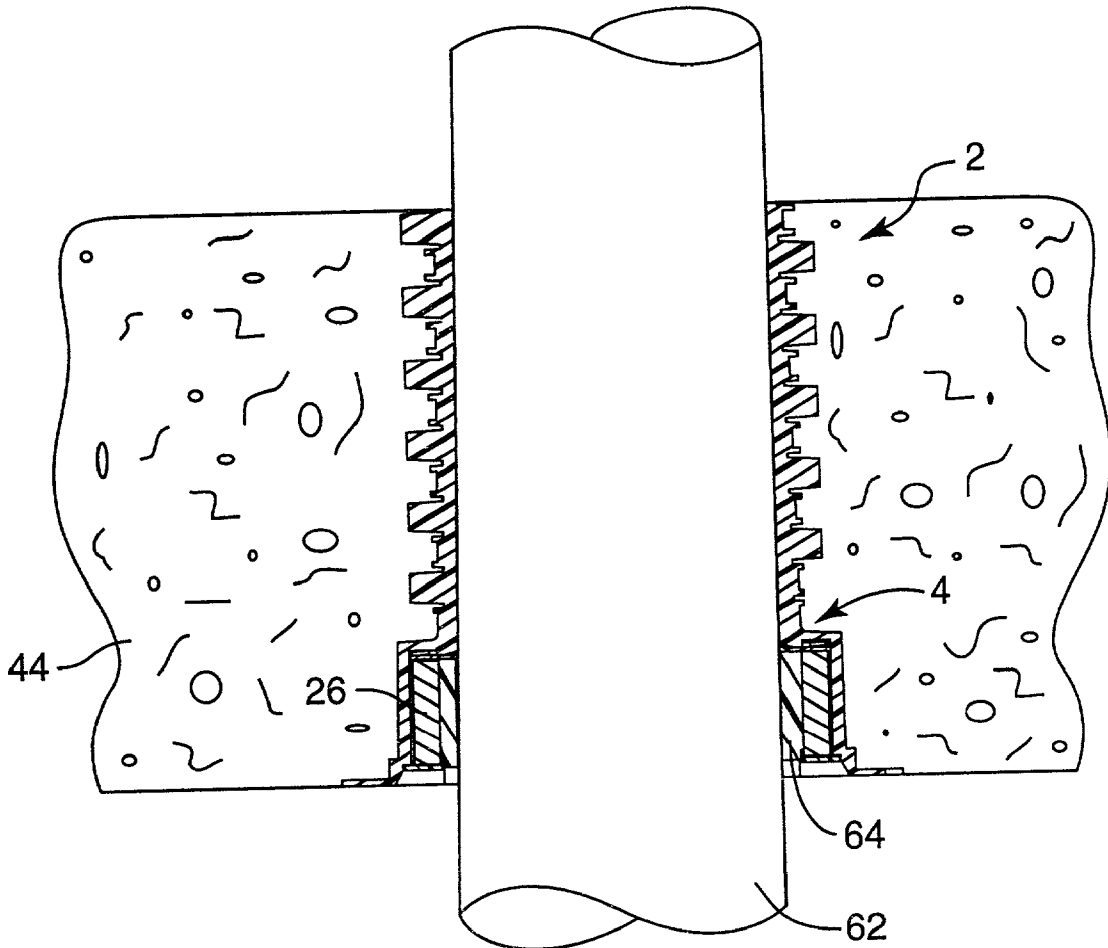
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(21) **Appl. No.: 10/205,180**

(22) **Filed: Jul. 26, 2002**

(57) **ABSTRACT**

A modular device for providing a passage through a partition in a structure. The modular device includes a riser housing comprising a chamber fluidly coupling a base opening in a base portion with a distal opening at a distal end and a shaped cavity housing comprising a shaped cavity, a primary opening and a secondary opening. A connector assembly releasably coupling the distal opening at the distal end of the riser housing to the secondary opening on the shaped cavity housing. An intumescent material is preferably located in the chamber.



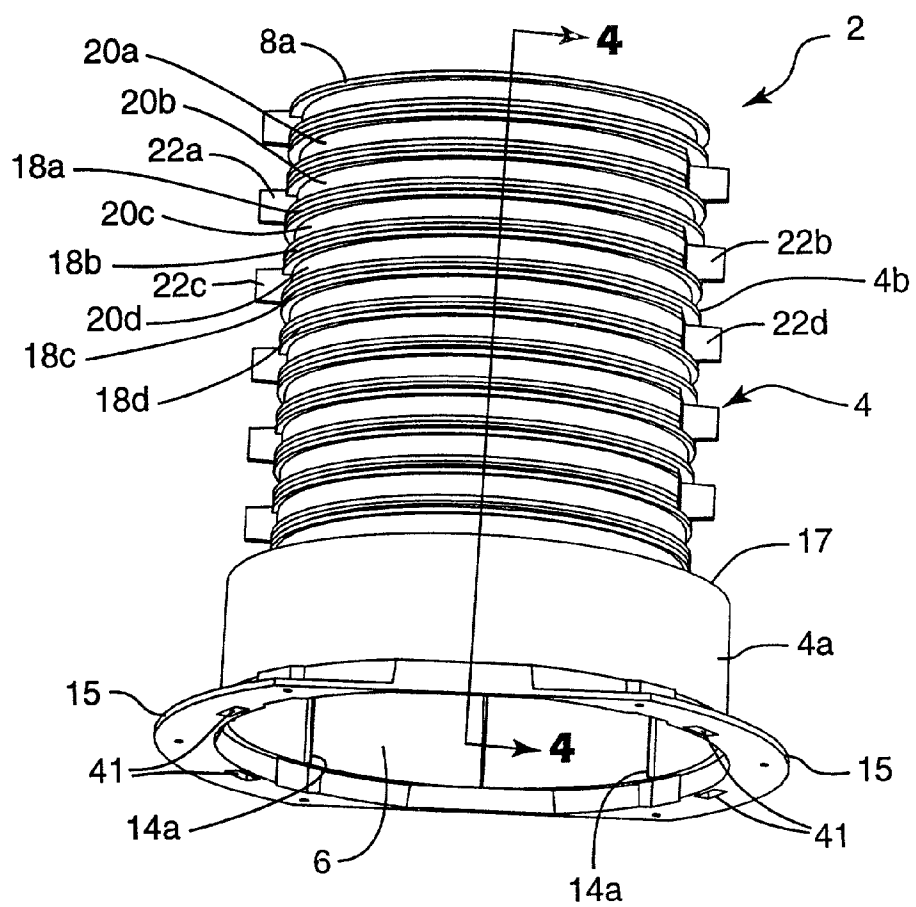


FIG. 1

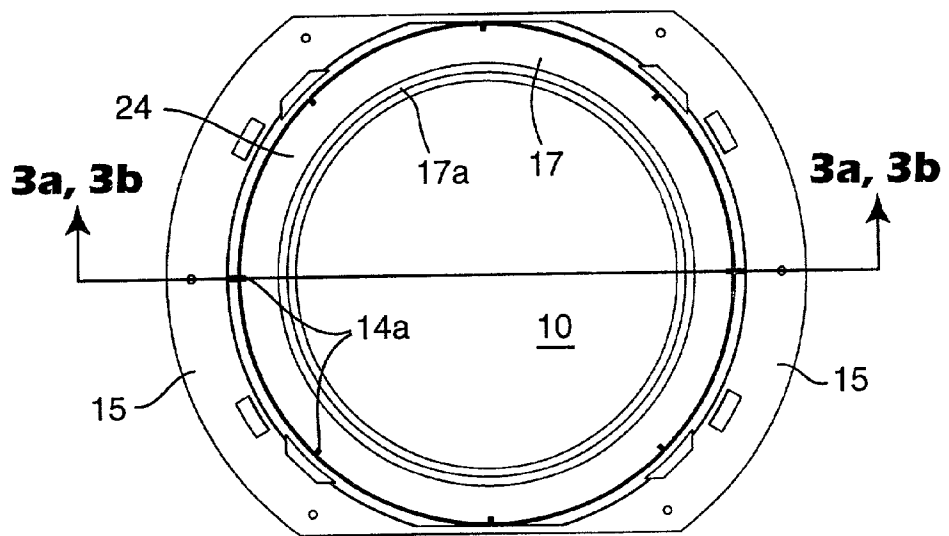
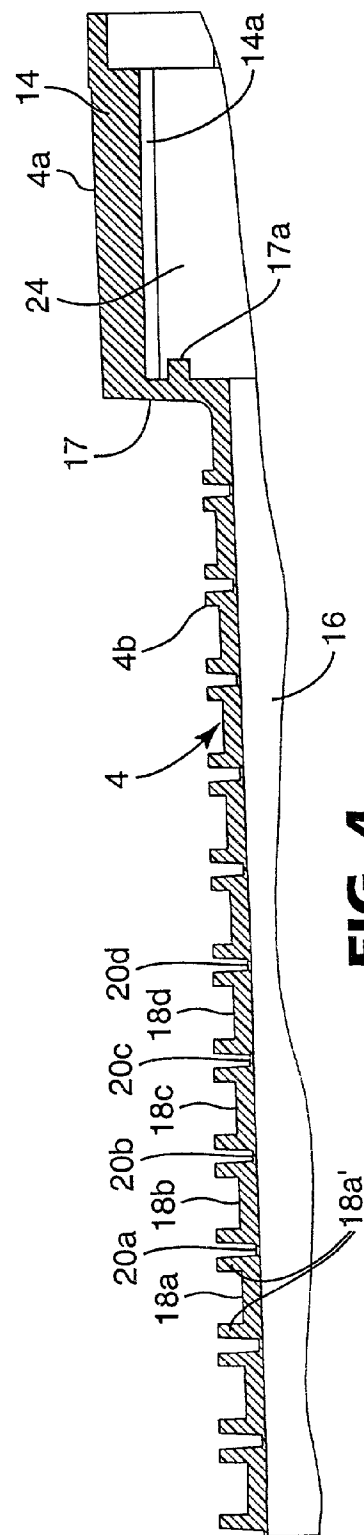
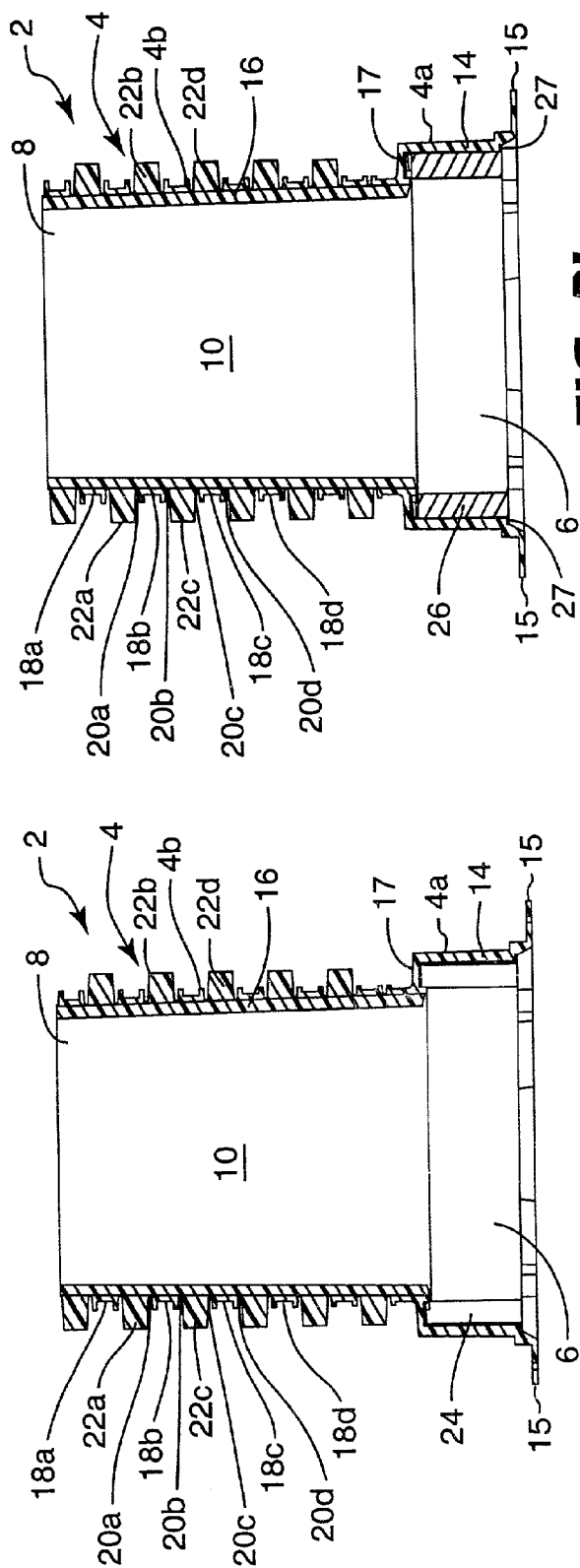


FIG. 2



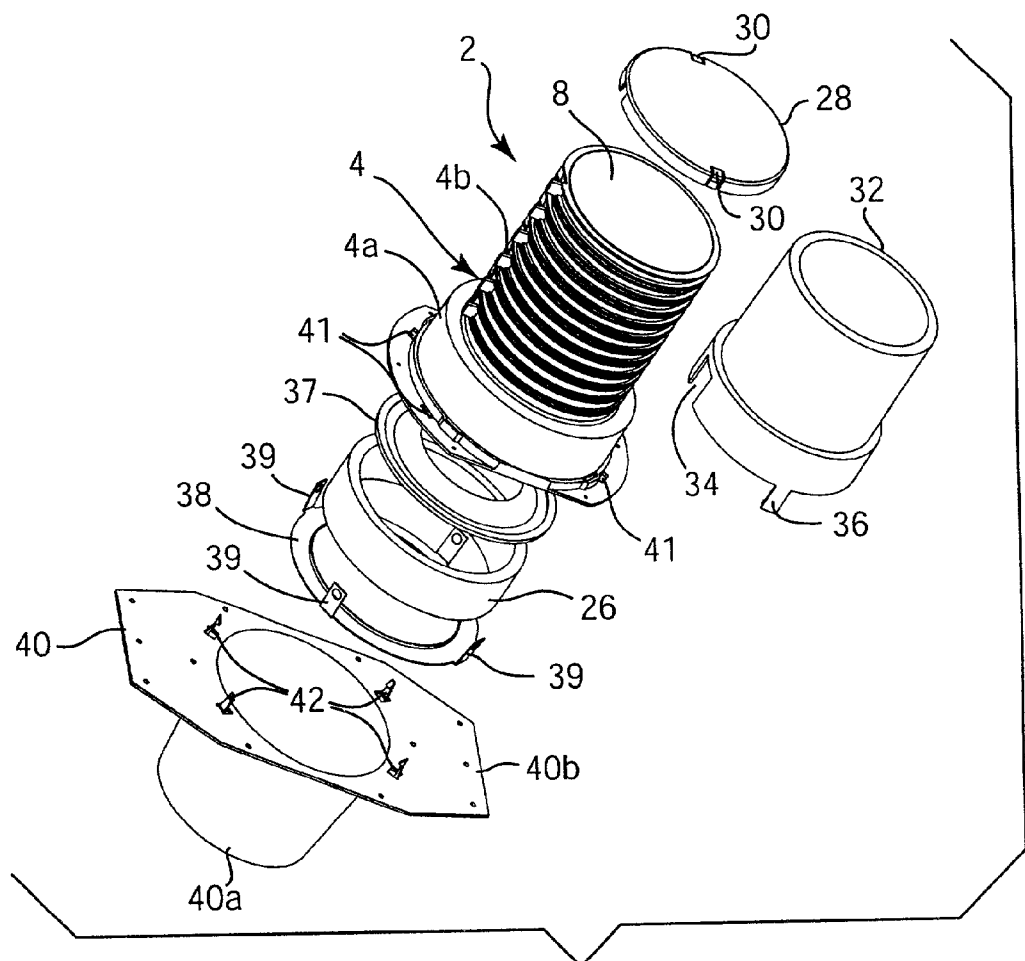


FIG. 5

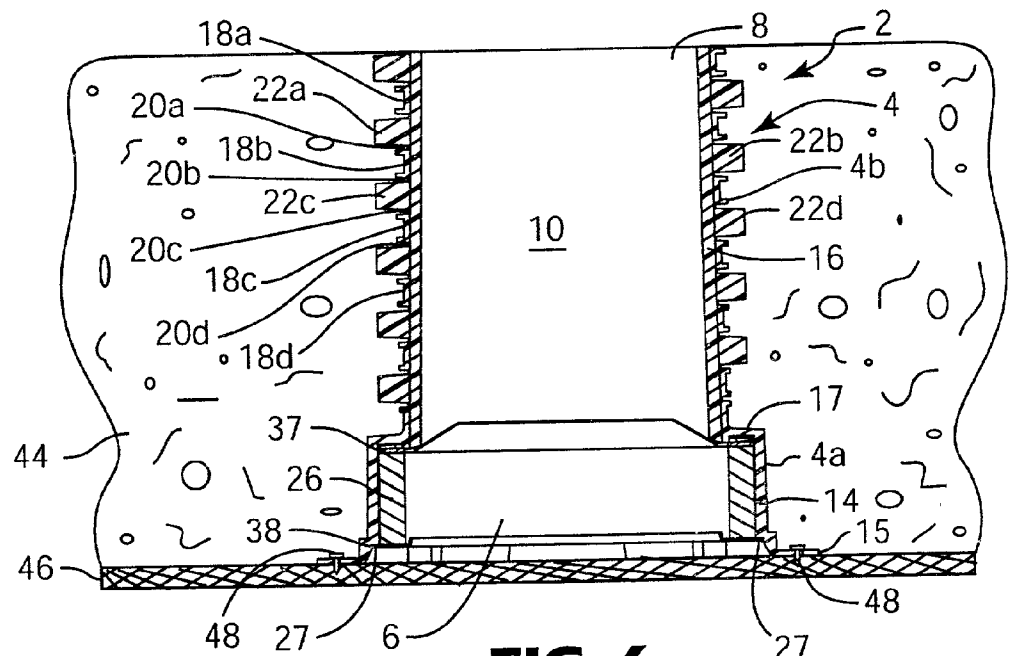


FIG. 6

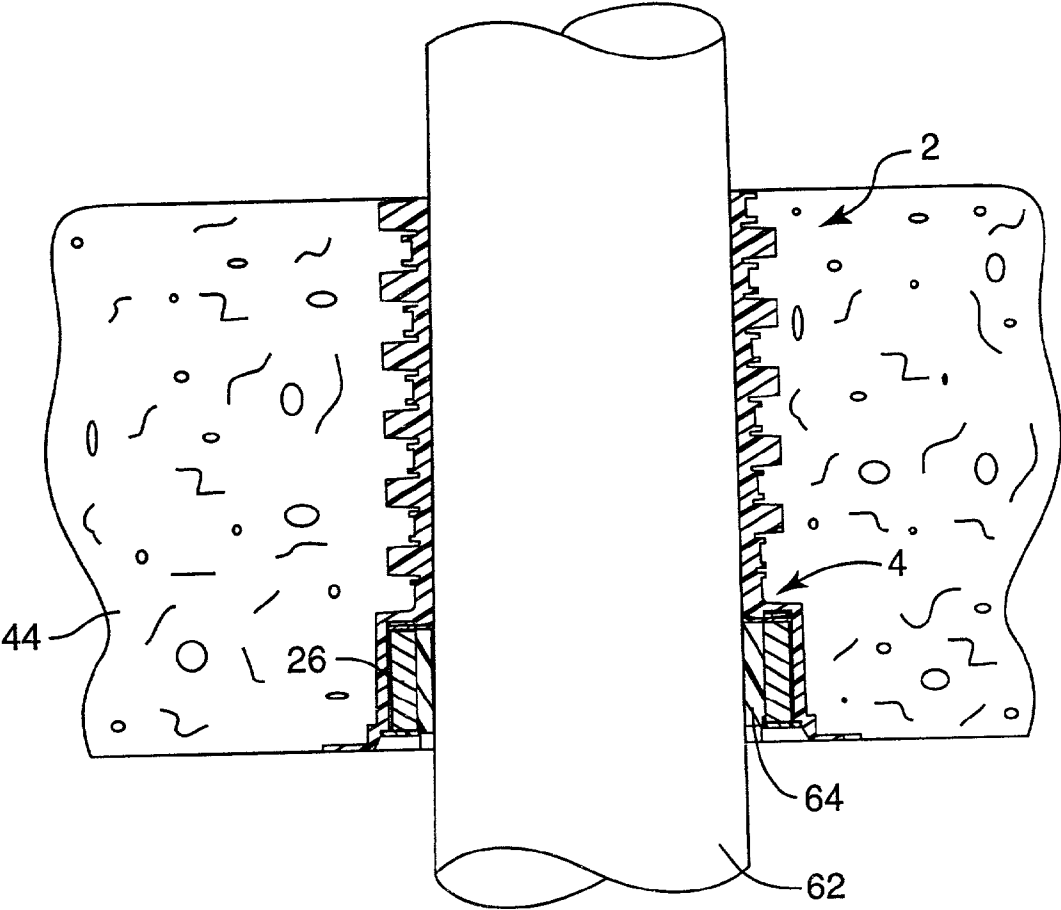


FIG. 7

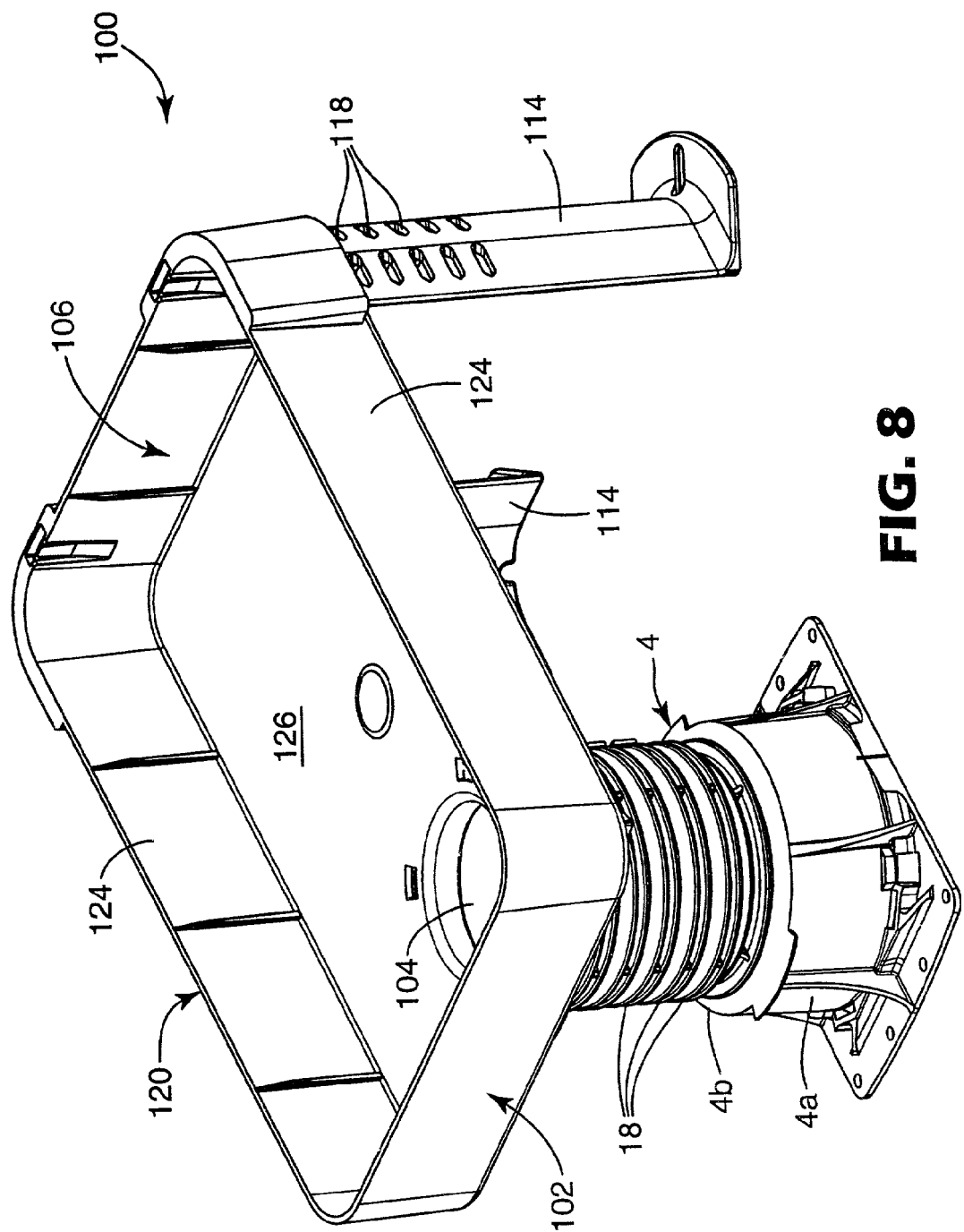


FIG. 8

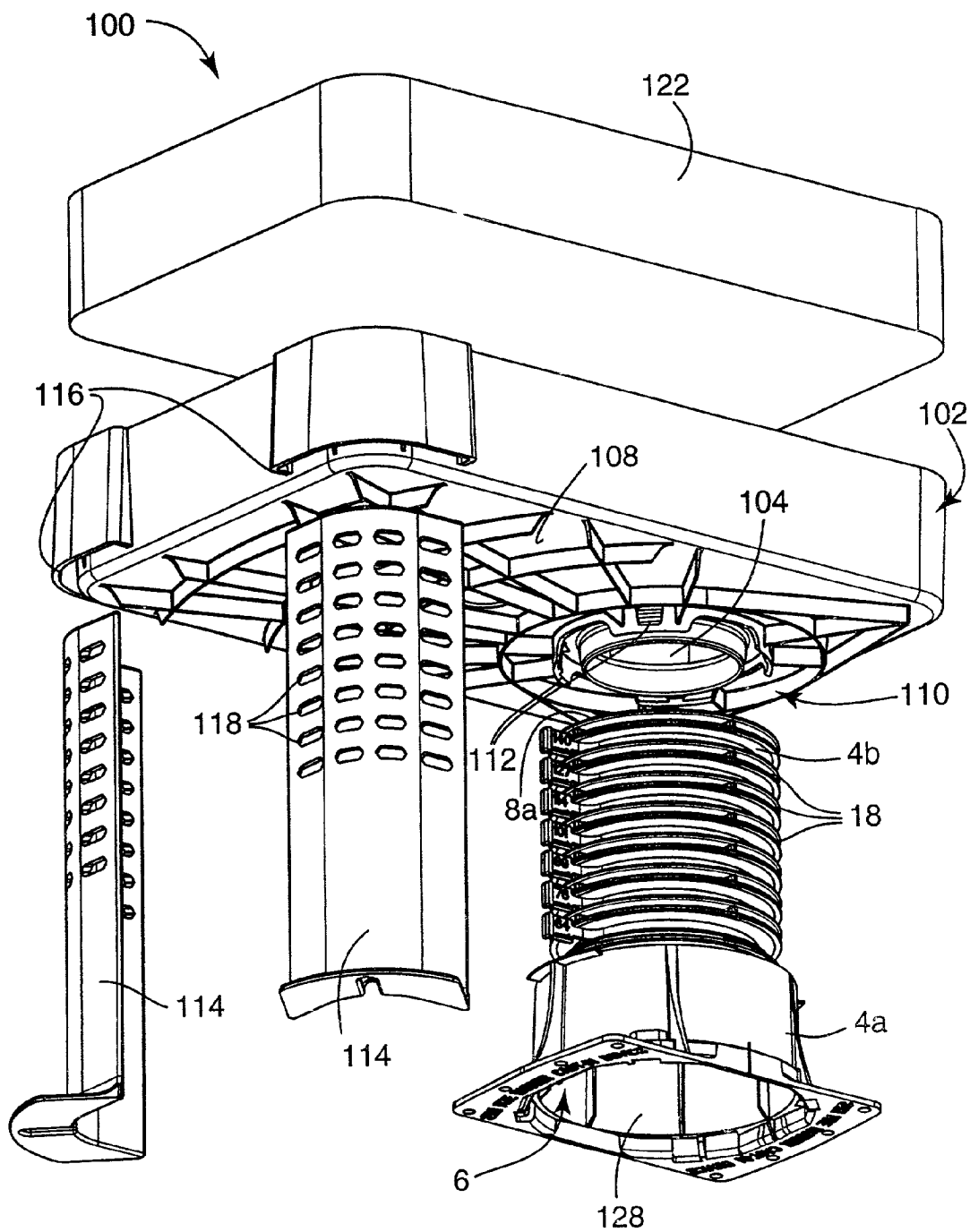


FIG. 9

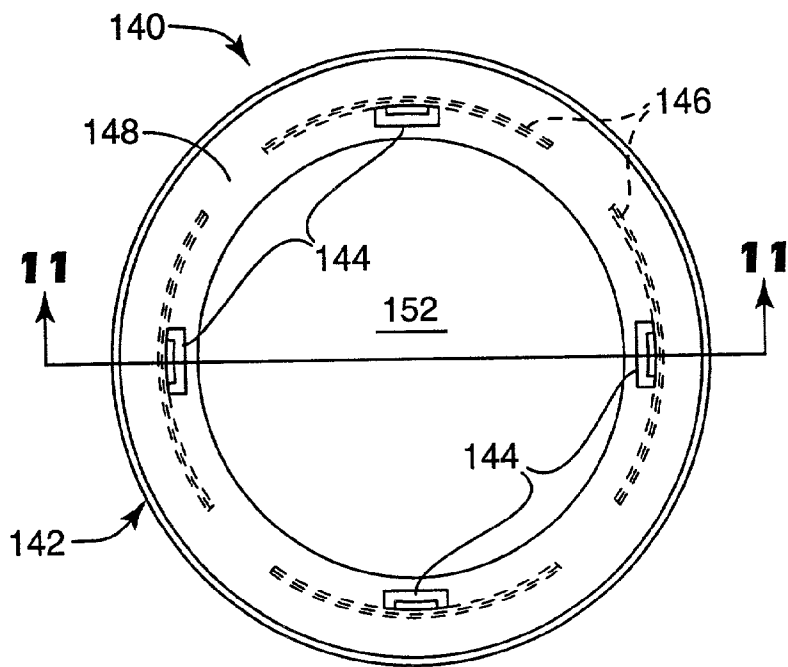


FIG. 10

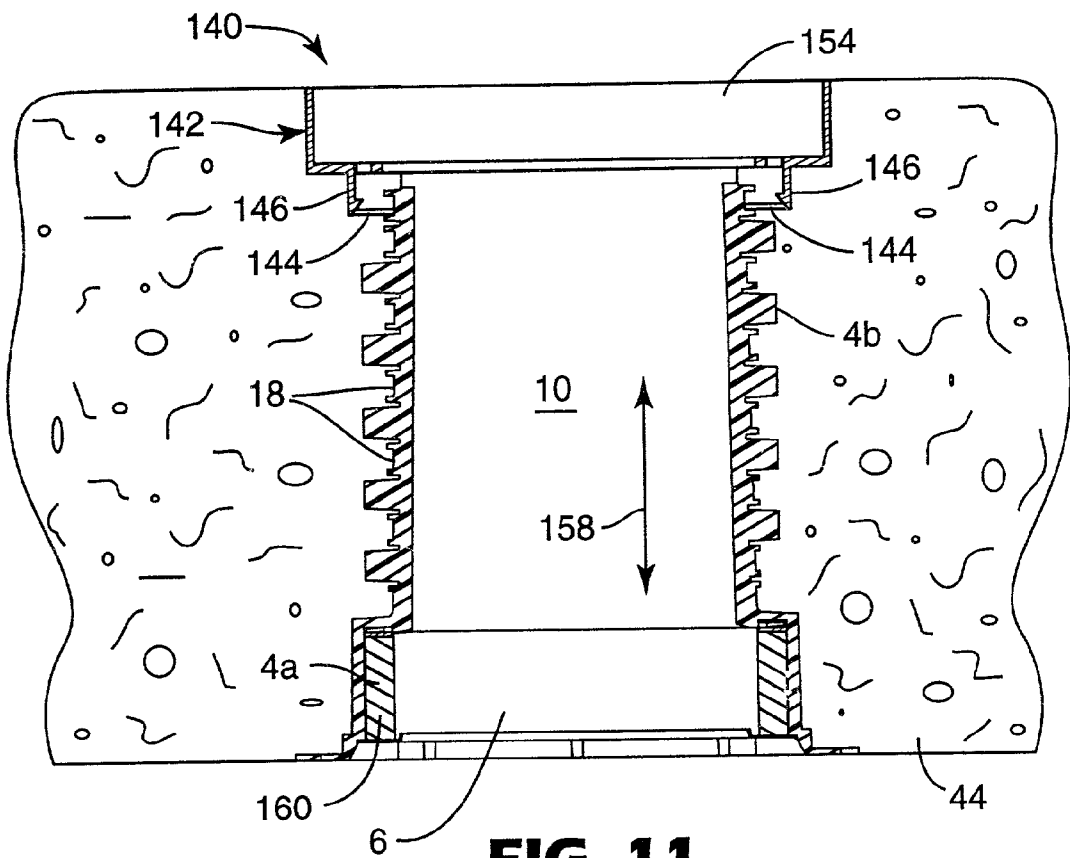


FIG. 11

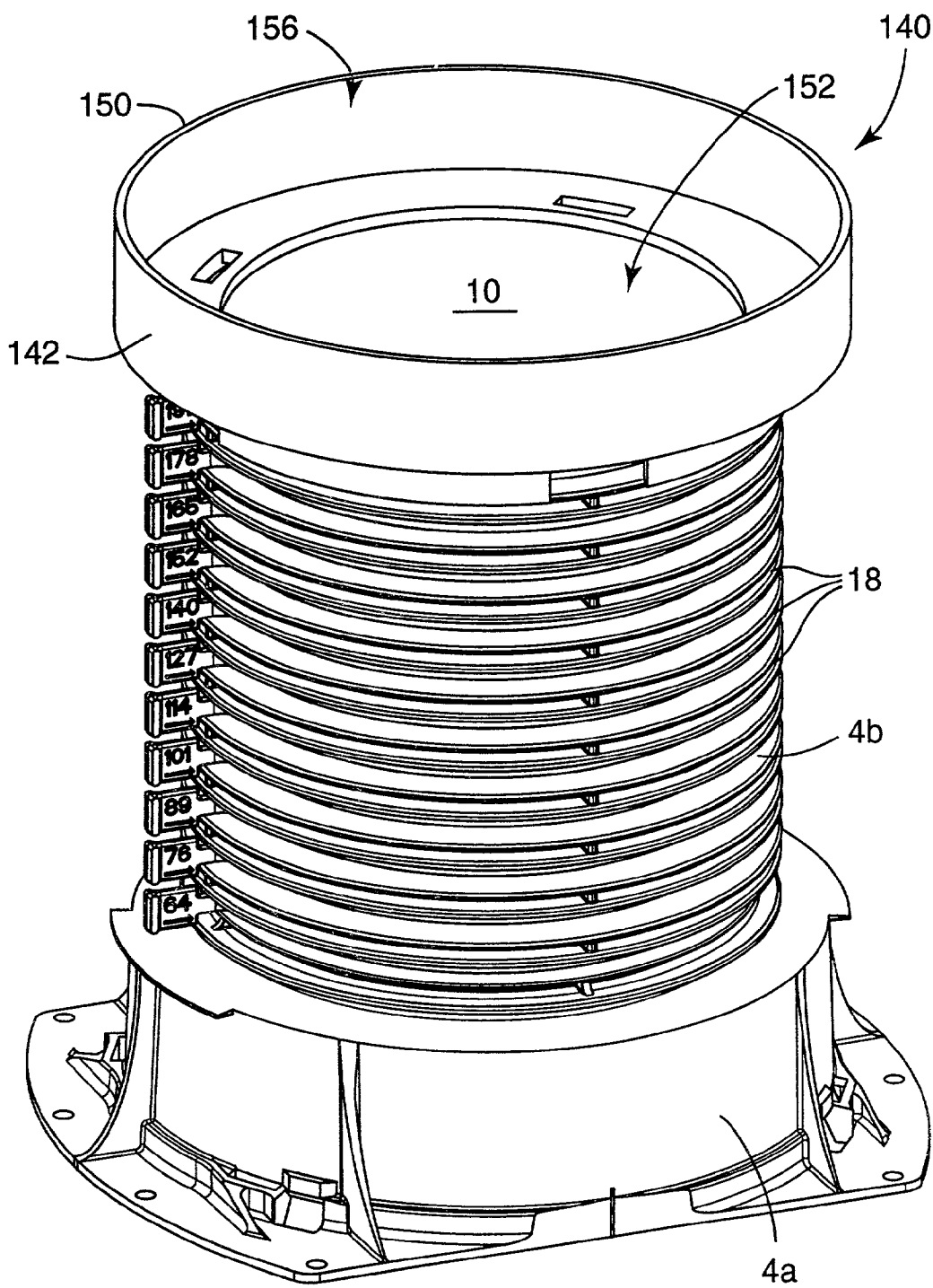


FIG. 12

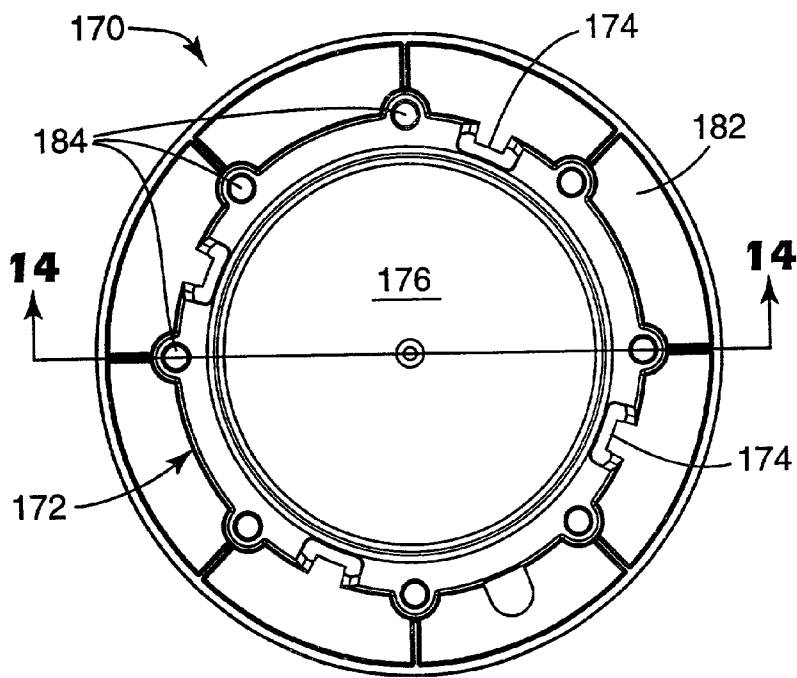


FIG. 13

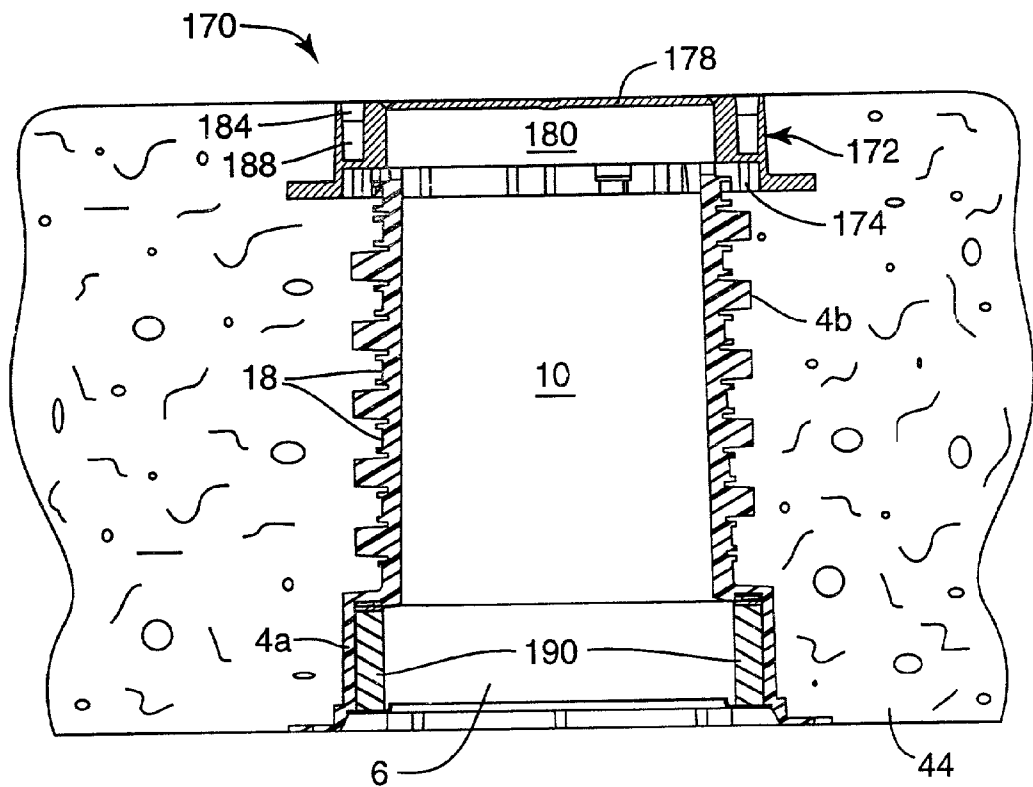


FIG. 14

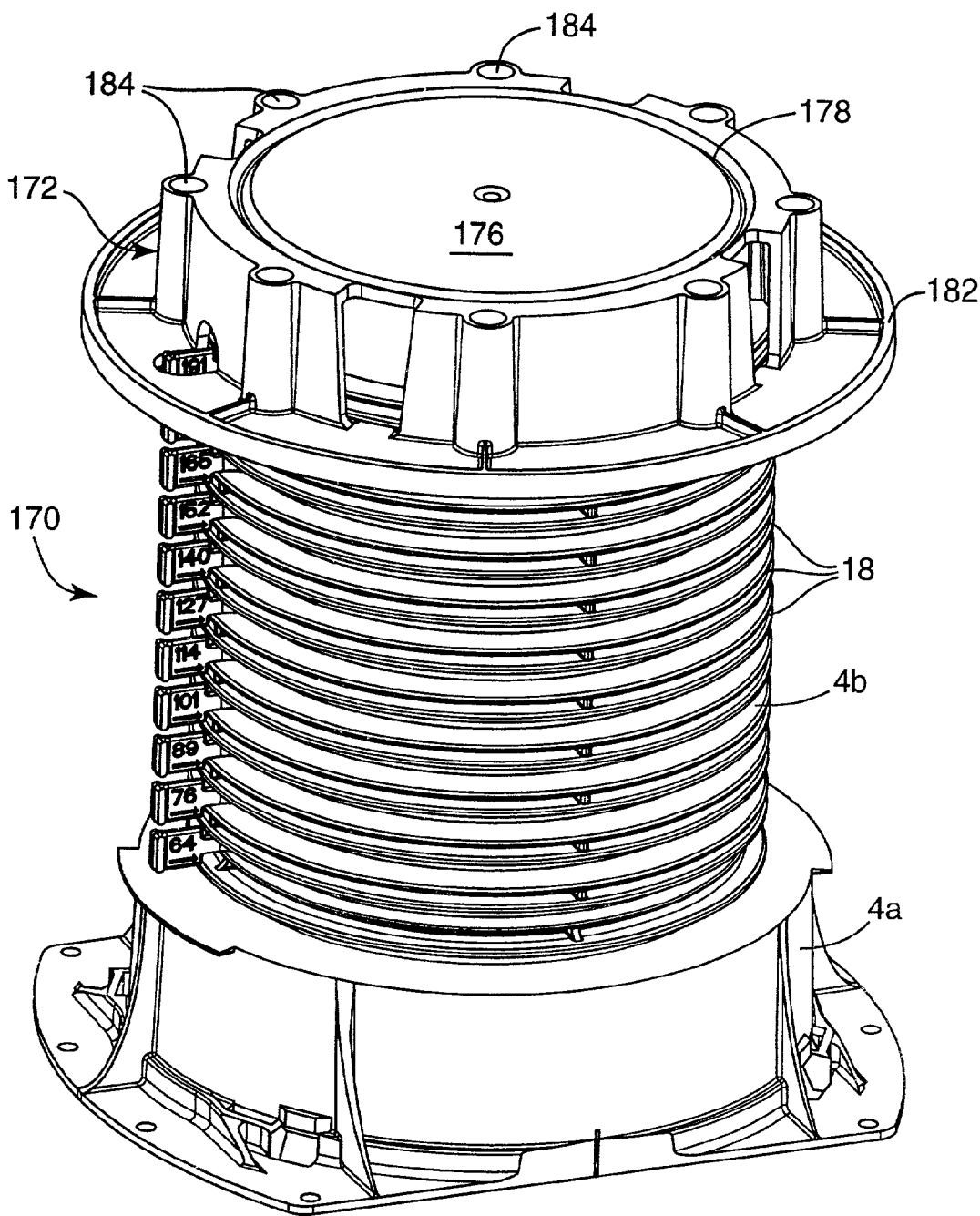


FIG. 15

MODULAR DEVICE TO CREATE A PASSAGE THROUGH A PARTITION

FIELD OF THE INVENTION

[0001] The present invention relates generally to a modular devices for passing cables, pipes, and the like through a partition, such as a floor, and in particular, to a modular cast in place device for forming through-penetrations in molded partitions. The present modular device can be used with or without a firestop material.

BACKGROUND OF THE INVENTION

[0002] During the construction of buildings, it is necessary to provide openings or passages through the building floors, walls, and ceilings to permit the running of wires, cables, pipes, and the like. Through-penetrations in molded partitions, such as poured concrete partitions, may be formed by various techniques including knocking holes in the partition after it has been formed, or using a mold or form that is arranged on a concrete form before the concrete is poured. Due to the variety of sizes and shapes needed for through-penetrations, contractors typically need to stock a large number of different forms. When the correct form is not available, workers often "make do" with a form of the wrong shape and/or size, causing the need for extensive rework after the concrete cures.

[0003] Additionally, through-penetrations provide one mechanism by which fire and smoke may spread from one compartment of the building to another. Intumescent firestop materials that expand and close an opening in the partition in the event of a fire are often required to minimize the migration of fire and smoke between compartments. The intumescent material is typically attached to the through-penetration after the concrete cures, increasing labor costs. If the intumescent material is not correctly installed and fails during a fire, the consequences can be catastrophic.

[0004] Cast-in-place devices for providing a through-penetration in a partition, typically with an intumescent material to close the passageway and prevent the spread of fire and smoke in the event of a fire, are known in the patented art. The Harbeke U.S. Pat. No. 4,669,759, for example, discloses a firestop stack coupling including intumescent material which expands to close off a pipe passing through the coupling in the event of a fire. The Harbeke U.S. Pat. No. 4,888,925 discloses a fire retardant fluid coupling assembly having a metallic band wrapped about an intumescent collar.

[0005] The Roth U.S. Pat. No. 5,347,767 discloses a smoke and fire protection device for providing a heat sealable raceway for running wires and cables through a concrete wall, ceiling, or floor. The device includes a thermally expansive material which, in the event of a fire, expands causing the raceway to collapse, thus preventing fire and/or smoke from passing through the wall, ceiling, or floor. The raceway slidably fits within a tubular housing allowing the raceway to extend through the sleeve to either side of the device, thereby allowing an installer to couple additional sections of the raceway at a convenient location remote from the device. The sleeve has a length sized to accommodate the thickness of the particular mounting location. Since the sleeve is sized to accommodate a particular partition thickness, the user must pre-select the appropriate

size sleeve for a particular job, thereby requiring installers to keep a large number of different size devices on hand.

[0006] The Rejecki U.S. Pat. No. 5,390,465 discloses a pass through firestop device for installation in a building wall or floor to provide a pass through opening for pipes, tubing, and the like. The device includes an axially open first end and a tubular body having a second end closed by a transverse wall. A ring of intumescent material fills the axially open first end. The device is installed during the formation of the building partitions by attaching the device to form elements and then pouring the floor or wall structure. After the floor is poured, the upper end section of the tubular body is removed by cutting it flush with the upper surface of the floor.

[0007] The Münzenberger et al. U.S. Pat. No. 6,161,873 discloses a masonry lead-in fixture having a housing including an axially extending through bore, a radially protruding attachment flange provided at least at one end of the housing, an intumescent material which, in case of fire, closes the bore, and a disc-shaped partition located in the housing which extends over the inner diameter of the bore which is broken when pipe, cable, or the like is pushed through the fixture. The fixture includes a lengthening pipe formed of a plastic material that is cut-off to a desired length.

BRIEF SUMMARY OF THE INVENTION

[0008] The present invention is directed to a modular device for providing a passage through a partition in a structure. The modular device includes a riser housing comprising a chamber fluidly coupling a base opening in a base portion with a distal opening at a distal end. A shaped cavity housing comprising a shaped cavity with a primary opening and a secondary opening is provided. A connector assembly releasably couples the distal opening at the distal end of the riser housing to the secondary opening on the shaped cavity housing.

[0009] In one embodiment, a firestop material is located in the chamber and/or the base portion. A flame retardant char forming material can optionally be arranged within the chamber adjacent to the firestop material. The term firestop material refers generally to intumescent, endothermic, and ablative materials useful in resisting the spread of fire and smoke from one compartment of a structure to another. In one embodiment, the flame retardant char forming material is an annular band arranged concentrically within the firestop material. The flame retardant char forming material serves to strengthen the expanded intumescent material such that the resulting mass forms a fire barrier that can pass the hose stream portion of ASTM E 814 Fire Test Standard.

[0010] In one embodiment, the connector assembly includes a plurality of flexible engagement members located on the shaped cavity housing adjacent to the secondary opening. The engagement members are adapted to releasably engage with ribs on the riser housing. The connector assembly can be integrally molded as part of the shaped cavity housing. Alternatively, the connector assembly can be a separate component. The connector assembly preferably provides a snap-fit relationship between the riser housing and the shaped cavity housing. The connector assembly can be a variety of other structures, including bayonet connectors, threaded structures, mechanical fasteners, and the like.

[0011] The modular device includes a cap that is attached to the shaped cavity housing to cover the primary opening. In one embodiment, the cap includes cantilevers that snap onto the circumferential ribs, thereby securely attaching the cap to the shaped cavity housing. In one embodiment, the cap is a breakable lid positioned substantially across the primary opening of the shaped cavity housing to prevent the molded material from filling the shaped cavity. Alternatively, a temporary insert can be located in the shaped cavity.

[0012] The shaped cavity housing can include reinforcing portions adapted to be molded into the partition. The shaped cavity housing can also include mounting holes for attaching fixtures or structures external to the partition.

[0013] The riser portion preferably includes a plurality of equally sized transverse bands each including a manually engagable pull tab to facilitate manual removal of the associated bands with or without the aid of a manually operated hand tool. By removing successive bands, a user can adjust the length of the device (i.e. shorten) in accordance with the thickness of the partition into which the device is installed. It will be recognized that providing more bands will increase the range of partition thicknesses that can be accommodated by the device, and increasing the number of bands per unit length will increase the ability of the device to more closely match the thickness of the partition. In addition, the pull tabs on each band may be provided with indicia indicating the length of the device at the band and corresponding to the thickness of the partition. Each band may also include one or more radially outwardly extending circumferential ribs that provide the bands and, consequently, the riser with added hoop strength, and also provide a projection for making snap connections with other components of the present modular device.

[0014] Frangible connections can be provided to facilitate removal of the transverse bands. The frangible connection can be formed in the riser housing by providing a line of weakness in the housing by, for example, scoring, notching, or creasing the housing, or by molding or machining the housing to have a thin region in the wall, thereby allowing a user to easily tear the housing along the line of weakness. The frangible connection defines a removable band that can be readily removed by a user, typically with the aid of a hand tool such as pliers, to shorten the length of the housing to accommodate the thickness of the partition into which the device is installed. The removable band preferably includes a pull tab that provides a grasping location for a user to remove the band from the housing along the frangible connection, thereby facilitating manual removal of the band.

[0015] The modular device may also include an extension member adapted to connect with the riser portion to increase the length of the device and allow the device to be used with partitions having thicknesses greater than the standard length of the device. The outer diameter of the extension is preferably sized so that standard size plastic pipe can fit over and connect with the extension to provide additional extension for the device.

[0016] The modular device preferably includes a retaining ring arranged within the base portion that serves to retain the firestop material in the base portion. The retaining ring may be coded with color or other indicia to indicate the quantity of firestop material provided in the device which, in turn, corresponds with the application of the modular device. An

adapter may also be provided that connects with the base portion to allow the modular device to be coupled to a contoured surface such as a fluted or corrugated deck.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0017] The present invention will be further described with reference to the accompanying drawings, in which:

[0018] **FIG. 1** is a perspective view of a modular device in accordance with the present invention.

[0019] **FIG. 2** is a bottom view of the modular device of **FIG. 1**.

[0020] **FIG. 3a** is a sectional view taken along line **3a-3a** in **FIG. 2**.

[0021] **FIG. 3b** is a sectional view taken along line **3b-3b** in **FIG. 2** showing the modular device with a firestop material arranged therein.

[0022] **FIG. 4** is a detailed sectional view taken along line **4-4** of **FIG. 1**.

[0023] **FIG. 5** is an exploded perspective view of a modular device including a cap, an extension member and an adapter in accordance with the present invention.

[0024] **FIG. 6** is a sectional view showing the modular device of **FIG. 3b** installed in a molded partition.

[0025] **FIG. 7** is a sectional view of an alternate embodiment of the invention showing a pipe passing through the modular device.

[0026] **FIG. 8** is a perspective view of a modular device including an attached shaped cavity housing in accordance with the present invention.

[0027] **FIG. 9** is an exploded view of the modular device of **FIG. 8**.

[0028] **FIG. 10** is top view of an alternate modular device in accordance with the present invention.

[0029] **FIG. 11** is a side sectional view of the modular device of **FIG. 10** cast in place in concrete.

[0030] **FIG. 12** is a perspective view of the modular device of **FIG. 10**.

[0031] **FIG. 13** is top view of an alternate modular device in accordance with the present invention.

[0032] **FIG. 14** is a side sectional view of the modular device of **FIG. 13** cast in place in concrete.

[0033] **FIG. 15** is a perspective view of the modular device of **FIG. 13**.

DETAILED DESCRIPTION OF THE INVENTION

[0034] **FIGS. 1-6** show a modular device **2** for providing a through-penetration in a floor, wall, ceiling, or the like. The term through-penetration or passage generally refers to an opening in a floor, wall, ceiling, or the like that is separate and distinct from the cables, wires, pipes, or other items that pass through it from one compartment of a structure to another. For example, plumbing refers to a system of pipes and fixtures concerned with the introduction, distribution

and disposal of water in a building. The present through-penetration or passage provides an opening for plumbing to pass through a partition, but does not perform any of the plumbing functions.

[0035] The present modular device 2 is particularly suited for forming a through-penetration or passage through a molded partition. As used herein, molded partition refers to a partition formed from a flowable material, such as for example concrete or structural foam, that sets or cures to create a more rigid structure. The modular device 2 is located in a mold or form having the desired shape and the flowable material is delivered. Once the flowable material is set or cured, the mold or form is removed. In this embodiment, the molded device 2 is cast in place. For example, the modular device 2 is secured to a wooden concrete form 46 (FIG. 6) or other surface, such as a fluted deck using an adapter 40 (FIG. 5), and concrete is poured into the form, thereby embedding the modular device 2 in the concrete forming the molded partition 44.

[0036] The modular device 2 includes a generally cylindrical hollow housing 4 having a base opening 6, a distal opening 8, and a chamber 10 extending longitudinally from the first end 6 to the distal opening 8. An intumescent firestop material 26 (FIGS. 3b, 6 and 7) can optionally be arranged in the modular device 2, typically adjacent the base opening 8. It will be recognized that the housing 4 may have any shape. For example, the shape of the housing 4 can change along its length. In some embodiments, the housing 4 has a regular cross section along its length, such as a circle, an oval, a square, a rectangle, or any other polygonal.

[0037] In one embodiment, base portion 4a is attached to the housing 4. The base portion 4a can be integrally molded to the housing 4 or can be a separate component to the present modular device. The base portion 4a includes a longitudinally extending annular side wall 14 extending from the open first end 6 toward the open second end 8, radially outwardly extending flange portions 15 extending outwardly in opposite directions from the base portion 4a adjacent the open second end 8, a radially inwardly extending shoulder portion 17 extending inwardly from the side wall 14, and a riser portion 4b having a longitudinally extending annular side wall 16 extending from the shoulder portion 17 to the distal opening 8. The base portion 4a preferably has a larger diameter than the riser portion 4b giving the housing 4 a two-tiered tapered configuration in which the base portion 4a has a greater cross-sectional area than the riser portion 4b.

[0038] Riser portion 4b includes a plurality of circumferential bands 18a, 18b, 18c, 18d (referred to collectively as "18") connected by frangible connections 20a, 20b, 20c, 20d (referred to collectively as "20"). The frangible connections 20 allow one or more bands 18 of the riser 4b to be quickly, easily, accurately, and cleanly removed by a user, typically with the aid of a manually operated hand tool such as pliers, at pre-selected intervals so the modular device 2 can be used in partitions having a variety of thicknesses.

[0039] Each frangible connection 20 is preferably located adjacent to one of the circumferential bands 18. After one of the frangible connections 20 is removed, a circumferential band 18 is preferably located near distal end 8a of the riser portion 4b to facilitate attachment to other components of the present modular device, as will be discussed in detail below.

[0040] Each circumferential band 18 preferably forms a continuous 360 degree loop which forms a section of the riser portion 4b that can be readily removed by a user to shorten the riser portion 4b and thereby match the thickness of the partition into which the device is installed. Each band 18 includes a pair of circumferential ribs 18a' (FIG. 4) that provide hoop strength and provide a structure for attaching other components of the modular device 2. The frangible connections 20 are lines of weakness formed by, for example, molding or machining the riser to have thin areas of material connecting adjacent bands 18 that can be manually broken by a user to separate adjacent bands.

[0041] Each band 18 includes a pull tab 22a, 22b, 22c, 22d (referred to collectively as "22") extending radially outwardly from the bands 18. The pull tabs 22 facilitate removal of the associated frangible connection 20 by providing the user a location to grasp and pull, typically with the aid of a hand tool such as pliers, thereby tearing the associated frangible connection 20 to remove the circumferential band 18 from the riser 4b. Each pull tab 22a-d may be marked with indicia indicating the length or height of the device at that pull tab.

[0042] In one embodiment, the base portion 4a contains an annular recess 24 for receiving an optional firestop material 26 (FIGS. 3b, 5, 6 and 7). The firestop material 26 is provided in the form of an annular ring as shown in FIG. 5 that extends along the inner surface of the sidewall portion 14 from the base opening 8 to the shoulder portion 17. The firestop material 26 may be held in place in the recess 24 with adhesive, using mechanical fasteners, or by using a retaining ring 38 (FIG. 5) described more fully below. To facilitate the installation of a pipe through the device 2, the inner surface of the firestop material 26 is preferably aligned with the inner surface of the riser portion 4b, that is, the inner diameter of the firestop material 26 and the riser 4b are the same, whereby the diameter of the chamber 10 is generally the same along the entire length of the device 2. In some embodiments, manufacturing can be facilitated if the inner diameter of the firestop material 26 is slightly larger than the inner diameter of the riser 4b.

[0043] The recess 24 is defined by the sidewall portion 14 and the shoulder portion 17 of the base portion 4a. In accordance with another characterizing feature of the invention, the inner surfaces of the sidewall portion 14 and the shoulder portion 17 facing the chamber 10 include rib portions 14a and 17a, respectively. The sidewall ribs 14a extend radially inwardly from the sidewall 14 and extend longitudinally from adjacent the flange 15 to the shoulder portion 17. The shoulder portion rib 17a is an annular projection extending outwardly from the shoulder portion 17 in the direction of the first opening 6. The side wall portion ribs 14a maintain the firestop material 26 in spaced relation from the sidewall portion 14 and create an air gap 27 between the firestop material 26 and the side wall portion 14 which, in the event of a fire, allows the entire axial length of the firestop material to be exposed to heated air, thereby aiding rapid, complete, and uniform expansion of the firestop material which in turn closes the through-penetration.

[0044] Referring now to FIG. 5, the modular device 2 is provided with a cap 28 that attaches to the riser portion 4b and covers the distal opening 8. The cap 28 prevents concrete being poured during the formation of a partition

from entering the device 2. The cap 28 includes snap connectors 30 that allow the cap to be manually snap fit onto the riser portion 4b at any of the via any of the circumferential bands 18.

[0045] The modular device 2 may also be provided with an extension member 32 that attaches to the top of the riser portion 4b adjacent the open second end 8. The extension member 32 contains cut-outs 34 aligned with tabs 22 on the riser portion 4b that allow the extension member 32 to be placed in overlapping relation with the riser portion 4b. Snap connections 36 are provided that allow the extension member 32 to be attached circumferential bands 18 on the riser portion 4b.

[0046] The extension member 32 serves to increase the height of the modular device 2 for use in partitions in which the thickness of the partition is greater than the standard height of the modular device 2. The extension member 32 is also preferably sized so that standard size plastic pipe can fit over the top of the extension member 32 to provide further extension. The outer diameter of the extension member 32 corresponds to the inner diameter of a standard size plastic pipe, such that the plastic pipe is adapted to fit over the extension member 32. In this embodiment, the extension member comprises an adapter for attaching other components to the present modular device 2.

[0047] The device includes an annular gasket 37 arranged in the recess 24 between the firestop material 26 and the shoulder portion 17. The gasket 37 is formed of an elastomeric material and serves to form a smoke and water seal at ambient conditions with the pipe installed prior to expansion of the firestop material. The modular device 2 is also provided with an annular retaining ring 38 that attaches to the base portion 4a of the device and retains the firestop material 26. The retaining ring 38 includes tabs 39 to facilitate attachment of the retaining ring 38 to the base portion 4a. The tabs 39 are aligned with and extend through slots 41 provided in the base portion 4a. Once the retaining ring 38 is installed in the modular device 2, the tabs 39 are bent outwardly to secure the retaining ring 38 in place and also anchor the modular device 2 in the partition. In embodiments where the modular device 2 is inserted into a molded partition, the tabs 39 are securely anchored in the concrete, for example.

[0048] Since the quantity of firestop material 26 provided in the modular device 2 will vary depending on the type of installation (for example, more firestop material will be provided in the device when it is used with a plastic pipe than a metal pipe), the retaining ring 38 may be provided with color coding to indicate the quantity of firestop material installed in the device and/or the type of pipe in the installation. This way, after the modular device 2 has been installed in a partition, the quantity of firestop material and the type of installation (i.e. a plastic pipe or a metal pipe installation) can be quickly and easily identified by visual inspection, eliminating the need to remove the retaining ring to make such a determination.

[0049] In addition, the modular device 2 may be provided with an adapter 40 that attaches to the base portion flange 15 and allows the modular device 2 to be used on contoured surfaces such as a fluted deck. The adapter 40 includes a hollow tubular extension portion 40a, an outwardly extending flange portion 40b, and snap connectors 42 that snap connect with the base portion 4a of the modular device 2.

[0050] The present modular device 2 is preferably formed of a synthetic plastic material such as polyethylene. The firestop material 26 may include an intumescent compound, an endothermic compound, or both an intumescent compound and an endothermic compound. Exemplary intumescent compounds include intumescent graphite such as intercalated graphite and acid treated graphite, hydrated alkali metal silicates, vermiculite, perlite, and NaBSi. Exemplary endothermic compounds include aluminum trihydrate (ATH), $\text{Al}(\text{OH})_3$ hydrated zinc borate ($\text{ZnB}_2\text{O}_4 \cdot 6\text{H}_2\text{O}$), calcium sulfate ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) also known as gypsum, magnesium ammonium phosphate ($\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$), magnesium hydroxide ($\text{Mg}(\text{OH})_2$), encapsulated H_2O , and magnesium ammonium phosphate hexahydrate, $\text{MgO} \cdot 2\text{B}_2\text{O}_3 \cdot 9\text{H}_2\text{O}$. A preferred firestop material 26 is INTERAM Ultra GS Graphite mat available from 3M Company, St. Paul, Minn.

[0051] FIG. 6 illustrates the modular device 2 installed in a concrete floor 44. The modular device 2 is installed by first securing the base portion 4a to wooden concrete form 46 with fasteners 48, and then pouring concrete into the form 46, thereby embedding the device in the concrete. The cap 28 is then removed and any unnecessary bands 18a-d are removed by grasping and pulling the pull tabs 22a-d. It will also be recognized that if the thickness of the partition is known, excess bands can be removed prior to installation and pouring of the concrete.

[0052] FIG. 7 illustrates the modular device 2 with fire stop material 26 is cast in place in a concrete floor 44. A metal pipe 62 is shown passing through the modular device 2. The modular device 2 in FIG. 7 is similar to the one shown in FIG. 6 except it further includes a flame retardant char forming insert 64 arranged between the intumescent firestop material 26 and the metal pipe 62. It has been found that by providing a flame retardant char forming material between the intumescent material 26 and the pipe 62, a fire barrier capable of passing the hose stream portion of the ASTM E814 test standard is created. Providing the char forming insert 64 is particularly useful when the modular device 2 is used as a firestop for a metal pipe passing through an opening in a floor.

[0053] The insert 64 can be a continuous annular band that is secured within the modular device 2 using adhesive, mechanical fasteners, or the retaining ring 38 described above. Alternatively, the insert 64 can be a discontinuous arcuate band that can be compressed like a spring clip so that the insert can be positioned within the intumescent material 26 and held in place by the spring force.

[0054] The insert 64 is formed of a flame-retardant material (i.e. one that does not support combustion) that does not melt and which forms a char when exposed to high temperatures such as those encountered in a fire. In this manner, insert 64 works in combination with the expanded intumescent material 26 to provide a fire, smoke, and water barrier in the annular space around the metal pipe that enables the device to pass the hose stream portion of the ASTM E814 test standard.

[0055] The particular material selected for the insert 64 is not critical to the invention hereof, so long as it provides the desired function. Suitable flame retardant materials that form a char include halogenated polymers such as polychloroprene, polyvinyl chloride and polyvinylidene fluoride;

chlorine flame retardant compounds such as perchloropentacyclodecane and chlorinated paraffins; bromine flame retardant compounds such as decabromodiphenyl oxide, octabromodiphenyl oxide, and tetrabromodipentaerythritol; phosphorous compounds such as ammonium polyphosphate and tributylphosphate; compounds including both chlorine and phosphorous such as 1,3 dichloro-2-propanol phosphate and 2-chloroethanol phosphate; and nonhalogenated polymers such as hydrated zinc borate and boric oxide. A preferred flame retardant char forming material for the insert is polyvinyl chloride.

[0056] FIGS. 8 and 9 illustrate an alternate modular device 100 in accordance with the present invention. Distal end 8a of riser housing 4b is shown releasably attached to a shaped cavity housing 102. The shaped cavity housing 102 of FIG. 8 includes a series of sidewalls 124 and a wall 126 opposite the primary opening 120. The wall 126 includes the secondary opening 104 that is aligned with the distal opening 8 (see FIG. 3a) on the riser housing 4b. Chamber 10 of the riser housing 4b (see FIG. 3a) is in fluid communication with shaped cavity 106 of the shaped cavity housing 102 and the base opening 6 in the base member 4a. In some embodiments, base member 4a may optionally include an intumescent material 128.

[0057] The shaped cavity housing 102 includes a primary opening 120 that provides access to the shaped cavity 106. The shaped cavity housing 102, however, can be any size or shape, depending on the application. It is not necessary for the primary opening 120 to extend the full length of the horizontal cross section of the shaped cavity housing 102. In some embodiments, the primary opening 120 may be smaller than the horizontal cross section of the shaped cavity 106.

[0058] A temporary insert 122 may optionally be located in the shaped cavity 106 in lieu of the cap 28 illustrated in FIG. 5. Alternatively, a covering can be provided that extends across the primary opening 120 to prevent concrete or other moldable material from entering into the shaped cavity 106 during the formation of the molded partition.

[0059] The size and shape of the shaped cavity 106 is designed to accommodate plumbing required to connect the drain and overflow of a bathtub. Bathtubs require two connections: a drain under the tub and an overflow at one end of the tub. The piping for these two locations must come together for a common connection at the end of the tub and at floor level for passing through the partition. The drain location under a bathtub must have a cavity in the concrete floor in order to allow room for the installer to reach in and make the necessary piping connections. Bathtub installation typically requires a tub box about 8 inches by 10 inches by 2 inches deep and slightly off to one side molded in the concrete floor. The modular device 100 of FIGS. 8 and 9 permits the generally cylindrical hollow housing 4 of FIG. 1 to be used in combination with a variety of shaped cavities, such as the tub box illustrated in FIGS. 8 and 9.

[0060] As best illustrated in FIG. 9, lower surface 108 of the shaped cavity housing 102 includes a connector assembly 110 for releasably coupling with distal end 8a of the riser housing 4b. In the illustrated embodiment, the lower surface 108 includes a plurality of snap connections 112 that engage with one of the circumferential bands 18 on the riser housing 4b. Any releasable connection between the riser housing 4b

and the lower surface 108 of the shaped cavity housing 102 can be used, such as for example bayonet connectors, threaded members, mechanical fasteners, and the like.

[0061] Depending on the size and shape of the shaped cavity housing 102, additional support members 114 may optionally be used. In the illustrated embodiment, the support members 114 are configured to engage with recess 116 on the shaped cavity housing 102. The support members 114 preferably include cutouts 118 that facilitate shortening to accommodate riser housings of different heights. Alternatively, the support members 114 can include frangible connections 20 such as are used on the riser housing 4b.

[0062] FIGS. 10, 11 and 12 illustrate an alternate modular device 140 in accordance with the present invention. Commercially available shower drains have flanges that may protrude below the floor level after installation. A cavity in the concrete floor is required to provide the space for this flange. Shaped cavity housing 142 is designed to receive commercially available shower drains.

[0063] As best illustrated in FIG. 11, the shaped cavity housing 142 includes engagement members 144 that form a snap fit relationship with the circumferential bands 18 on the riser housing 4b. The engagement members 144 are preferably constructed as a portion of support ribs 146 located on lower surface 148 of the shaped cavity housing 142.

[0064] Chamber 10 in the riser member 4b is in fluid communication with the secondary opening 152 to shaped cavity 156 and the base opening 6 on the base member 4a. The base opening 6 and the distal opening 8 on the riser housing 4b are preferably arranged generally along longitudinal axis 158. An intumescent material 160 can optionally be located in the chamber 10, and in particular, in the base member 4a. A temporary insert 154 may optionally be located in the shaped cavity 156 in lieu of the cap 28 illustrated in FIG. 5. Alternatively, a covering over the primary opening 150 can be used.

[0065] FIGS. 13, 14 and 15 illustrate an alternate modular device 170 in accordance with the present invention. Shaped cavity housing 172 is releasably attached to the riser housing 4b by engagement members 174 in a snap fit relationship with circumferential bands 18. Breakable cap 176 extends across primary opening 178 of the shaped cavity housing 172. As best illustrated in FIG. 14, shaped cavity 180 located below the breakable cap 178 is in fluid communication with chamber 10 of the riser housing 4b and the base opening 6 in the base member 4a. An intumescent material 190 can be optionally located in the chamber 10, and in particular, in the base member 4a.

[0066] The shaped cavity housing 172 includes a reinforcing portion 182 that increases the overall structural integrity of the component, but also is preferably imbedded in the molded partition 44 (see FIG. 14). For example, FIG. 14 illustrates the modular device 170 cast in place in a concrete floor. The reinforcing portion 182 acts to secure the shaped cavity housing 172 within the molded material (e.g., concrete) of the molded partition 44.

[0067] The shaped cavity housing 172 also includes a plurality of mounting holes 184 adapted to secure fixtures and other devices to the modular device 170. For example, commercially available water closets can be bolted to the mounting holes 184 of the shaped cavity housing 172. Securing the water closet directly to the shaped cavity housing 172 has the added benefit of centering the water closet over the passage formed by the modular device 170.

The modular device **170** provides the conduit through which the plumbing for the water closet passes, but is not intended to replace the plumbing.

[0068] In one embodiment, threaded inserts **188** can be located in the mounting holes **184**. The threaded inserts can be constructed of a variety of materials, such as steel, brass, copper, high-density polymeric materials and the like. Although the typical water closet only requires two mounting holes, the present shaped cavity housing **172** includes eight mounting holes **184**. This feature permits the water closet to be rotated to a variety of positions, permitting a more flexible installation options.

[0069] All of the patents and patent applications disclosed herein, including those set forth in the Background of the Invention, are hereby incorporated by reference. Although specific embodiments of this invention have been shown and described herein, it is to be understood that these embodiments are merely illustrative of the many possible specific arrangements that can be devised in application of the principles of the invention. Numerous and varied other arrangements can be devised in accordance with these principles by those of ordinary skill in the art without departing from the scope and spirit of the invention. Thus, the scope of the present invention should not be limited to the structures described in this application, but only by the structures described by the language of the claims and the equivalents of those structures.

What is claimed is:

1. A modular device for providing a passage through a partition in a structure, the modular device comprising:

a riser housing comprising a chamber fluidly coupling a base opening in a base portion with a distal opening at a distal end;

a shaped cavity housing comprising a shaped cavity, a primary opening and a secondary opening; and

a connector assembly releasably coupling the distal opening at the distal end of the riser housing to the secondary opening on the shaped cavity housing.

2. The modular device of claim 1 comprising a firestop material located in the chamber.

3. The modular device of claim 2 comprising a flame retardant char forming material arranged within the chamber adjacent to the firestop material.

4. The modular device of claim 2 comprising a flame-retardant char forming material is arranged within said firestop material.

5. The modular device of claim 2 comprising an annular band of a flame retardant char forming material arranged concentrically within the firestop material.

6. The modular device of claim 2 comprising a polyvinyl chloride flame retardant char forming material.

7. The modular device of claim 1 comprising a firestop material located in the base member.

8. The modular device of claim 1 wherein the connector assembly comprises a plurality of flexible engagement members located on the shaped cavity housing adjacent to the secondary opening adapted to releasably engage with the riser housing.

9. The modular device of claim 1 wherein the connector assembly is integrally molded as part of the shaped cavity housing.

10. The modular device of claim 1 wherein the connector assembly provides a snap-fit relationship between the riser housing and the shaped cavity housing.

11. The modular device of claim 1 comprising a breakable lid extending substantially across the primary opening of the shaped cavity housing.

12. The modular device of claim 1 comprising a temporary insert located in the shaped cavity.

13. The modular device of claim 1 wherein the shaped cavity housing comprises a reinforcing portion adapted to be molded into the partition.

14. The modular device of claim 1 wherein the shaped cavity housing comprises at least one mounting holes.

15. The modular device of claim 1 wherein the shaped cavity housing comprises a mounting structure adapted to releasably engage with a device external to the partition.

16. The modular device of claim 1 comprising support members releasably attachable to the shaped cavity housing.

17. The modular device of claim 16 wherein the support members comprise cut outs for adjusting the length thereof.

18. The modular device of claim 1 wherein the riser housing comprises at least one frangible connection transecting the riser housing defining a removable band.

19. The modular device of claim 18 wherein the removable band comprises a pull tab.

20. The modular device of claim 18 wherein removable band includes indicia indicating the length of the modular device.

21. The modular device of claim 1 wherein the base opening and the distal opening on the riser housing are arranged generally along a longitudinal axis.

22. The modular device of claim 1 wherein the base portion comprises a flange with mounting holes.

23. The modular device of claim 1 wherein the riser housing comprises a generally cylindrical shape.

24. A modular device adapted to be cast in place to provide a passage through a molded partition in a structure, the modular device comprising:

a riser housing comprising a chamber fluidly coupling a base opening in a base portion with a distal opening at a distal end;

a shaped cavity housing comprising a shaped cavity, a primary opening and a secondary opening; and

a connector assembly releasably coupling the distal opening at the distal end of the riser housing to the secondary opening on the shaped cavity housing.

25. The modular device of claim 24 comprising a firestop material located in the chamber.

26. The modular device of claim 24 wherein the connector assembly comprises a plurality of flexible engagement members located on the shaped cavity housing adjacent to the secondary opening adapted to releasably engage the riser housing.

27. The modular device of claim 24 comprising a breakable lid extending substantially across the primary opening of the shaped cavity housing.

28. The modular device of claim 24 comprising a temporary insert located in the shaped cavity.

29. The modular device of claim 24 wherein the shaped cavity housing comprises a reinforcing portion adapted to be molded into the partition.

30. The modular device of claim 24 wherein the shaped cavity housing comprises a mounting structure adapted to releasably engage with a device external to the partition.

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