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(54) RECEPTACLE FOR ENCLOSING LOW-VOLTAGE ELECTRONIC DEVICES IN A BUILDING STRUCTURE

(76) Inventors: **Craig A. Jacks**, Mound, MN (US); **Steven Neujahr**, St. Paul, MN (US)

Correspondence Address:
CROMPTON, SEAGER & TUFTE, LLC
1221 NICOLLET AVENUE
SUITE 800
MINNEAPOLIS, MN 55403-2420 (US)

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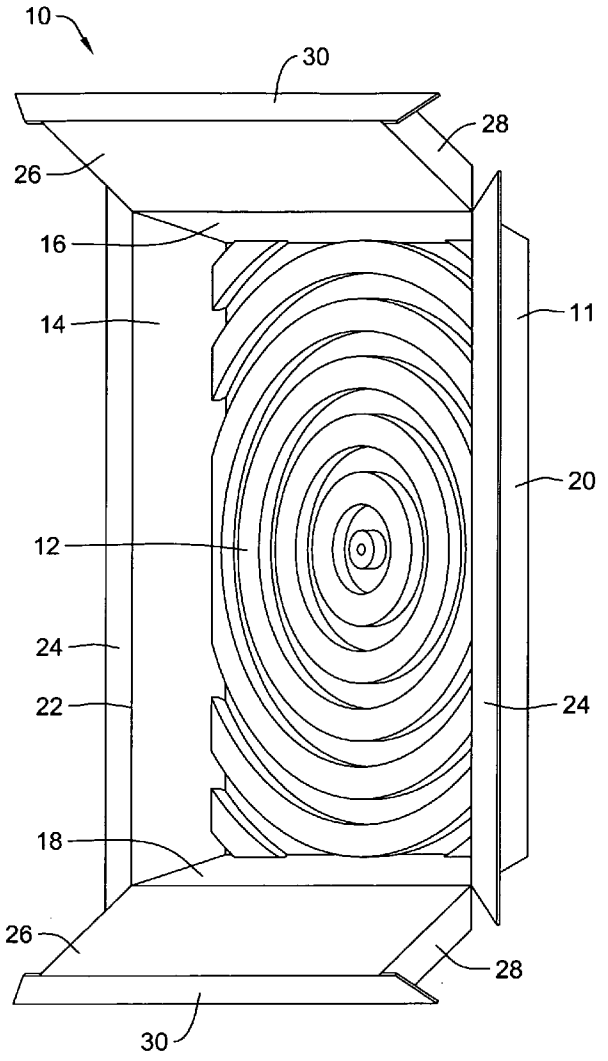
(57) **ABSTRACT**

A box for receiving an electrical device and preserving the vapor barrier, which may include a wall defining a cavity having an opening, the wall having a perimeter proximate the opening, a base, a first pair of flanges disposed on the perimeter attachable to a first surface of a structural member of a building and a first surface of a second structural member, a pair of flaps disposed on the perimeter, a second set of flanges disposed on the flaps for attachment to the first and second structural member, the second flange attachable to the first surface of the structural member or to a second surface of the structural member different from the first surface when the first flange is attached to the structural member, and a third set of flanges disposed on the flaps. A method of use thereof includes installing the box between two structural members such that the two structural members, the base, the perimeter and the flaps create a cavity for the installation of a low voltage electronic device.



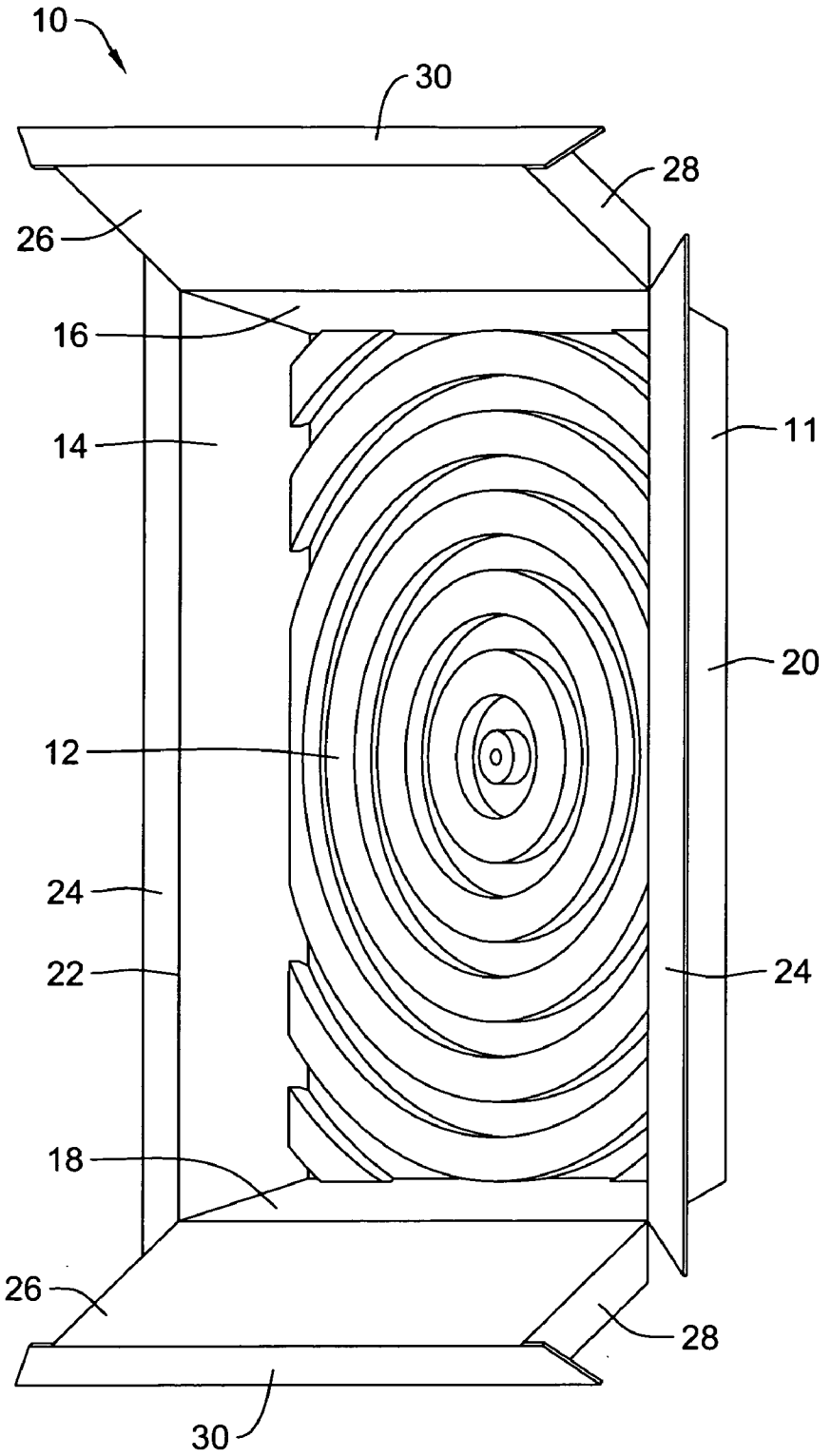


Figure 1

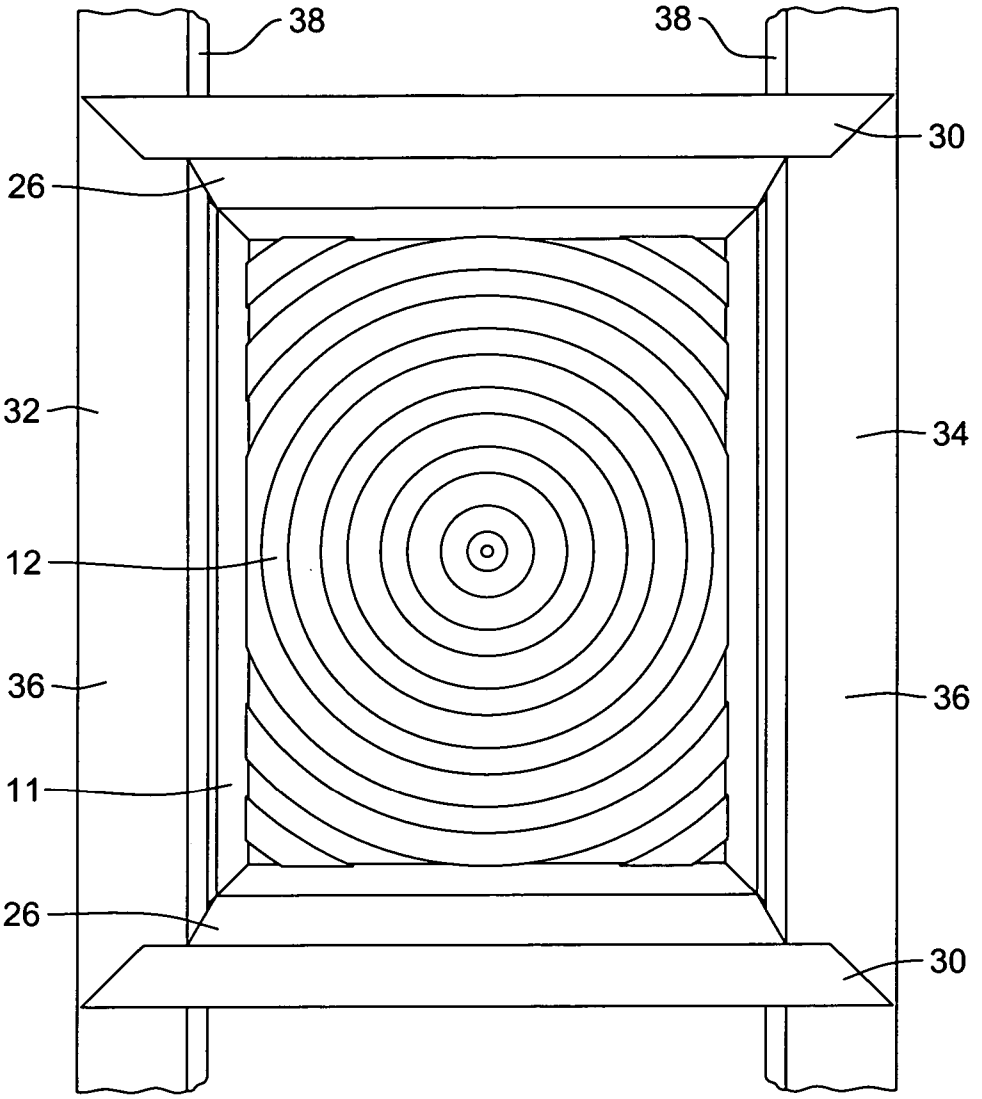


Figure 2

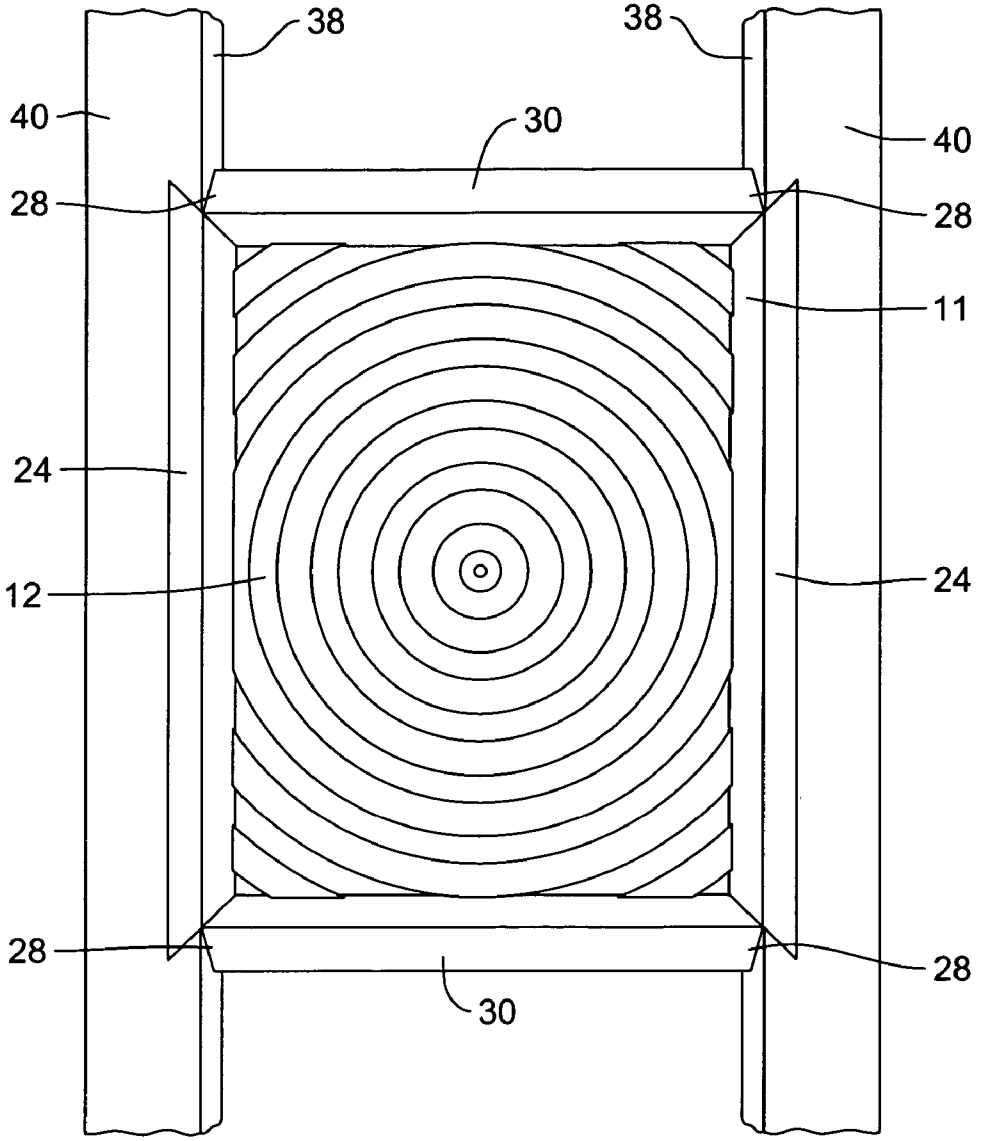


Figure 3

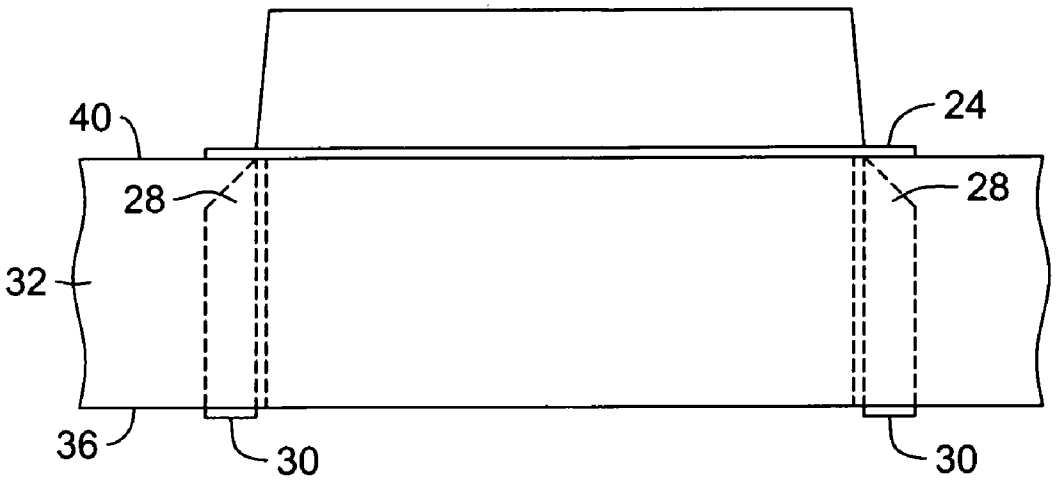


Figure 4

RECEPTACLE FOR ENCLOSING LOW-VOLTAGE ELECTRONIC DEVICES IN A BUILDING STRUCTURE

FIELD OF THE INVENTION

[0001] The present invention relates generally to components for building construction. More particularly, the present invention relates to receptacles for enclosing low voltage electronic devices.

BACKGROUND OF THE INVENTION

[0002] With the rising cost of energy, efforts have been made to provide homes and other buildings with insulation which will more efficiently prevent the loss of heat to the outside. Modern building techniques include the installation of a vapor barrier in the walls of homes or other buildings.

[0003] The vapor barrier contains warm, moist air inside the building. If warm air from inside the building penetrates the vapor barrier, moisture from this air may condense inside the walls and ceilings of the building. This condensed moisture can promote mold growth and cause building materials to degrade. The loss of warm air from the inside of the building to the outside of the building also increases the cost of heating the structure.

[0004] When mounting speakers, keypads and other low voltage electronic devices in the wall or ceiling of a house or other building it is desirable to protect the low voltage devices from exposure to dirt, debris from building materials and other substances which may cause these devices to deteriorate. Installers who place low-voltage electronic devices in the walls of structures often use standard building materials to fabricate a "custom-built" enclosure at the installation site. To comply with modern building requirements, these custom-built enclosures must be substantially impervious to warm, moist air, and they must be sealingly connected to the existing vapor barrier of the structure. A great deal of skill is required to assemble an enclosure at a work site which will accomplish these goals. Even when an installer is highly skilled, this task is very time consuming.

SUMMARY OF THE INVENTION

[0005] One embodiment pertains to a receptacle enclosing low voltage electronic devices and maintaining the integrity of a vapor barrier. The receptacle includes a base and four side walls. Each side wall is joined to two adjacent side walls to form a perimeter wall. The perimeter wall is joined to the base and extends from it in a generally perpendicular fashion. The perimeter wall and base delineate a generally rectangular enclosure with five closed sides and one open side. A first pair of flanges may be disposed on opposite sides of the perimeter wall. A pair of flaps may be disposed between the flanges. A second set of flanges may be disposed on the flaps proximate the perimeter wall. A third set of flanges may be disposed on the ends of the flaps.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. **1** is a perspective view of a receptacle for enclosing low voltage electronic devices in a wall;

[0007] FIG. **2** is a top view of a receptacle for enclosing low voltage electronic devices positioned in a wall;

[0008] FIG. **3** is a bottom view of a receptacle for enclosing low voltage electronic devices positioned in a wall; and

[0009] FIG. **4** is a side view of a receptacle for enclosing low voltage electronic devices positioned in a wall.

DETAILED DESCRIPTION OF THE INVENTION

[0010] Reference is now made to the figures, in which like element numbers refer to like elements throughout. FIG. **1** is a perspective view of a receptacle shown generally by element number **10**. Receptacle **10** includes a base **12**, and four side walls **14**, **16**, **18**, and **20**. Each side wall is joined to two adjacent side walls to form a perimeter wall **11**, which forms perimeter opening **22**. Perimeter wall **11** is joined to base **12** and extends from base **12** in a generally perpendicular fashion. Alternatively, perimeter wall **11** may be larger at opening **22** and taper slightly to base **12**. Perimeter wall **11** and base **12** thereby delineate a generally rectangular enclosure with five closed sides and one open side.

[0011] A first set of flanges **24** are joined to side walls **14** and **20**. A set of flaps **26** are joined to side walls **16** and **18**. A second set of flanges **28** are joined to the each of the sides of flaps **26** proximate perimeter opening **22**. As can be better seen in FIG. **3**, this embodiment includes four flanges **28**. A third set of flanges **30** are joined to the outer edges of flaps **26**

[0012] Base **12** may include a pattern of concentric geometrical shapes The center of pattern is generally aligned with the center of the base. The pattern may be a pattern of concentric circles or a pattern of other suitable geometric shapes. For example, the pattern could be a pattern of polygons, such as triangles, or squares.

[0013] The pattern may also be created on base **12** using a variety of techniques. For example, the pattern could be injection molded with a series of raised lines which constitute the pattern. Alternately, the pattern could be printed on a label and the label could be adhered to the base. Pattern could also be printed directly onto the base using conventional printing methods such as pad printing or screen printing.

[0014] The pattern may be formed by alternating ridges and grooves in the base, which may serve to stiffen the base in addition to creating the pattern. Stiffening of the base is particularly valuable when receptacle **10** is used to house audio speakers. If the base was substantially flexible, an audio speaker may cause it to vibrate and create undesirable noise.

[0015] The receptacle may include one or more wire locator dimples that may be in a suitable location such as the perimeter wall, the base, or the flaps. Wire locator dimples may each be comprised of a localized projection formed from the same material as the wall but extending away from the wall. The material thickness of wire locator dimples may be generally thinner that the material thickness of the side walls and the base.

[0016] The wire locator dimples may be useful for creating a hole allowing a wire to pass through one wall of the receptacle. For example, if an installer intends to pass a wire through the perimeter wall, a knife or other cutting tool may be used to cut off a wire locator dimple. Cutting off a wire

locator dimple creates a small circular hole in the wall. When installing a low-voltage electronic device in a receptacle a wire will be pulled through this hole. When the desired length of the wire is pulled through the hole, the hole may be sealed using any commercially available sealant such as silicone caulk or acrylic caulk. Sealing the hole which allows the wire to enter the receptacle is necessary in order to maintain a continuous vapor barrier within the wall.

[0017] In one embodiment of the receptacle, a layer of pressure sensitive adhesive may be applied to any or all of the flanges. The pressure sensitive adhesive may be covered with a release liner to prevent the pressure sensitive adhesive from adhering to any objects while the receptacle is transported and stored prior to use. The release liner may be comprised of a layer of paper or plastic film treated with a release agent. Release liner materials of this type are well known in the art and may use silicone or fluoropolymer based release agents.

[0018] The receptacle may be made from any substantially rigid material. One suitable material for the receptacle is a thermoplastic material such as ABS or PVC. Thermoplastic materials are low in cost and they can be easily fabricated using conventional injection molding, or thermoforming processes. In many applications a flame-retardant thermoplastic material will be preferred.

[0019] Receptacle **10** is shown installed between a structural member **32** and a structural member **34** of a building in FIGS. **2**, **3** and **4**, which are front, back and side views of the installation, respectively. Structural members **32** and **34** include top surfaces **36**, facing surfaces **38**, and bottom surfaces **40**.

[0020] In FIG. **2**, flaps **30** are shown spanning structural members **32** and **34** and positioned generally perpendicularly to flaps **26**. In this installation, base **12**, perimeter wall **11**, flaps **26** and facing surfaces **38** form a cavity suitable for the installation of a low-voltage electronic device.

[0021] As can be seen in FIG. **3**, flaps **28** are secured to facing surfaces **38** of structural members **32** and **34**, and flaps **24** are secured to bottom surfaces **40**.

[0022] In this installation, as can be best seen in FIG. **4**, the thickness of structural members **32** and **34** between surfaces **36** and **40** is substantially equal to the length of flaps **26**. However, receptacle **10** may be easily installed between structural members of any thickness. For thinner structural members, flaps **26** may be angled outward until flanges **30** can be fastened to surfaces **36**. For thicker structural members, flanges **24** may be bent backwards and fastened to facing surfaces **38** rather than surfaces **40** of the structural members. Alternatively, flanges **28** and **30** and flaps **26** may be folded to be in a plane with flanges **24**. Then, all flanges **24**, **28** and **30** may fastened to surfaces **36** of the structural members. Thus receptacle **10** may be used with a wide variety of structural members.

[0023] Structural members **32** and **34** may be comprised of a number of commonly used building materials including steel, aluminum, and wood, and may be a portion of a building wall.

[0024] Receptacle **10** may be used in a vapor barrier installation. A vapor barrier prevents the passage of moist air from inside the building to the outside of the building. To accomplish this, a barrier film is placed between the structural members and the interior wall cladding, such as plaster, wood, acoustic tiles, gypsum board, or a wood fiber composite material. The barrier film typically includes multiple sheets of material that is impervious to air and water. The sheets are sealingly attached to each other along the edges and any holes in the material are sealed.

[0025] Receptacle **10** may be used in a method to install a low-voltage electronic device in a wall while preserving the integrity of a vapor barrier. Receptacle **10** may be installed between two structural members as described above so that the facing surfaces of the two structural members, and the flaps, perimeter wall and base of the receptacle form a cavity for the low-voltage electronic device. The flanges may be fastened to the surfaces of the structural member using any suitable fasteners. For example, staple, screws, nails, rivets, adhesive, or tape may be used.

[0026] An end of a wire may be disposed inside receptacle **10**. The wire may pass through a wire entry hole in the perimeter wall of the receptacle. The wire entry hole may be formed by cutting off a wire dimple. A wire coil or bundle may formed of wire and may disposed immediately outside one wall of receptacle **10**.

[0027] Receptacle **10** may be installed in any portions of a building without departing from the spirit or scope of this invention. For example, receptacle **10** may be mounted in a ceiling or a wall to house an audio speaker.

[0028] The wire entry hole may be covered by seal that is adhesively bonded to both the wire the receptacle. The seal may be created by dispensing a sealant onto both the wire and the receptacle in the vicinity of the wire entry hole, and then allowing the sealant to cure. The sealant may be any one of a number of commercially available materials including silicone caulk and acrylic caulk. The seal ensures the integrity of the vapor barrier by closing the wire entry hole made in the receptacle to accommodate the wire.

[0029] If desired, a plurality of mounting brackets for mounting the electronic device may be disposed in the receptacle. The mounting brackets may be attached to the receptacle with mechanical fasteners (not shown) such as rivets or screws or adhered with an adhesive.

[0030] A vapor barrier may then be installed over the structural members and the receptacle. The vapor barrier may be sealed to the opening perimeter created by flanges **30** and surfaces **36**. A number of methods may be used to accomplish this seal. In one embodiment, a pressure sensitive adhesive layer is pre-applied to flanges **30** and covered with a release liner. Double-sided pressure sensitive adhesive strips may be removably installed on or in receptacle **10**. These strips may then be removed from the receptacle and installed on surfaces **36** of the structural members between flanges **30**. The release liner is removed prior to covering receptacle **10** with a barrier film. When the barrier film is positioned over receptacle **10** it will readily adhere to the pressure sensitive adhesive layer and form a sealed connection with the flange and the structural members.

[0031] An alternate method for sealing the barrier film to the flanges and the structural members is to apply an adhesive to the flanges and the structural members just prior to covering receptacle **10** with the barrier film. Spray on adhesives suitable for this purpose are commercially avail-

able from 3M Company (St. Paul, Minn.). Finally, sealing tape may also be use to seal the barrier film to flanges and the structural members.

[0032] Further information on alternative methods and embodiments may be found in U.S. Pat. No. 6,437,241, entitled "Receptacle for Enclosing a Low-Voltage Electronic Device in a Wall", which is hereby incorporated by reference in its entirety.

[0033] Numerous advantages of the invention covered by this document have been set forth in the foregoing description. It will be understood, however, that this disclosure is, in many respects, only illustrative. Changes may be made in details, particularly in matters of shape, size, and arrangement of parts without exceeding the scope of the invention. The inventions's scope is, of course, defined in the language in which the appended claims are expressed.

What is claimed is:

1. A box for receiving an electrical device and preserving the vapor barrier, comprising:

a wall defining a cavity having an opening, the wall having a perimeter proximate the opening;

a first set of flanges disposed on the perimeter attachable to a first surface of a structural member of a building and a first surface of a second structural member; and

a second set of flanges for attachment to the first and second structural member, the second set of flanges attachable to the first surfaces of the structural members or to a set of facing surfaces of the structural members different from the first surfaces, when the first flange is attached to the structural member.

2. The box of claim 1, wherein the second set of surfaces are perpendicular to the first surfaces.

3. The box of claim 1, further comprising a pair of flaps flexibly attached to the perimeter of the box.

4. The box of claim 3, wherein the second flanges are disposed on the flaps.

5. The box of claim 3, further comprising a third set of flanges, the third set of flanges disposed on the flap.

6. The box of claim 1, wherein the wall comprises a flat base wall surrounded by a perimeter wall.

7. The box of claim 6, further comprising a geometric pattern disposed on the base wall.

8. The box of claim 1, wherein the wall comprises a thermoplastic material.

9. The box of claim 1, further comprising an adhesive disposed on the first flange.

10. The box of claim 1, further comprising a length of wire disposed at the receptacle, at least a portion of the length being disposed at the receptacle extending in a first direction and a generally oppositely disposed second direction.

11. The box of claim 1, further comprising a pair of removable double-sided adhesive strips.

12. The box of claim 1, wherein the flaps and the flanges are flexibly attached.

13. The box of claim 10, wherein the wire extends in the first and second direction to form a coil.

14. The box of claim 10, wherein the wire extends in the first and second direction to form a zig/zig pattern.

15. The box of claim 1, further comprising a vapor barrier material disposed near the opening.

16. The box of claim 15, further comprising an elongate structural member disposed proximate the perimeter between the opening and the vapor barrier material.

17. The box of claim 16, wherein the vapor barrier is sealed to the elongate structural member.

18. A method of enclosing a low-voltage device and maintaining the integrity of a vapor barrier, comprising the steps of:

providing a receptacle having a base portion, a wall surrounding the base and defining a cavity and a perimeter opening, a first set of flanges attached to the wall on the perimeter opening, and a second set of flanges;

positioning the receptacle within a wall of a building so that a first flange of the first set of flanges is disposed on a first face of a first structural member of the building and a second flange of the first set of flanges is disposed on a first face of a second structural member of a building;

positioning a first flange of the second set of flanges on a second surface of the first structural member;

positioning a second flange of the second set of flanges on a second surface of the second structural member; and

securing the receptacle to the first and second structural member.

19. The method of claim 18, further comprising the steps of:

positioning a vapor barrier film over the first and second structural members;

sealing the barrier to the receptacle; and

creating a hole within the vapor barrier film proximate the perimeter opening.

20. The method of claim 18, further comprising the steps of:

forming an aperture in the receptacle; and

passing a conductive wire through the receptacle aperture.

21. The method of claim 18, further comprising the steps of:

forming a cavity for housing a low-voltage electronic device from the receptacle and the first and second structural members.

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