US 20070227088A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2007/0227088 A1

O'Hanley (43) Pub. Date: Oct. 4, 2007

(54) METHOD AND APPARATUS TO IMPROVE OR DEFINE VENTING FROM THE OTHER SIDE OF A STRUCTURE

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(21) Appl. No.: **11/715,716**

(22) Filed: **Mar. 8, 2007**

Related U.S. Application Data

(60) Provisional application No. 60/780,726, filed on Mar. 8, 2006.

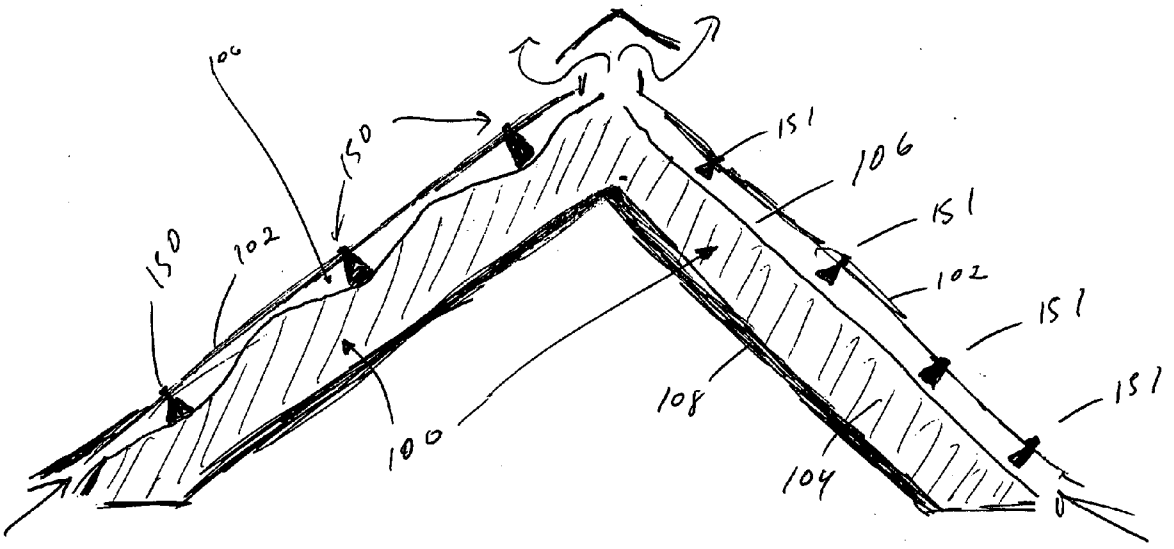
Publication Classification

(51) **Int. Cl.**
E04B 1/70 (2006.01)

(52) **U.S. Cl.** **52/407.1**; 52/199; 52/302.1

(57) **ABSTRACT**

A ventilation method and apparatus is described for use in building structures to improve or define ventilation air space. The method and apparatus may be deployed from one side of a structure to penetrate through the structure to displace insulation or improve or define air space for ventilation located on the other side of the structure. The structure may be any structure such as, but not limited to, roofs, walls, floors, cavities, or structures with internal moisture production. For structures which are enclosed with limited or no access to inspect or modify or remedy the ventilation, such as a cathedral ceiling and roof assembly structure, this method and apparatus provides a previously unavailable alternative of modifying or improving or defining the airspace and ventilation, performed from an outer position in relation to the structure. Previous to this invented method and apparatus, one would have had no alternative but to have to dismantle and reassemble the structure to access, modify, remedy and define the insulation and airspace. This invented method and apparatus allows the user to quickly and easily modify and define the airspace on the other side of the structure without all the work that would go into the traditional dismantling and reassembling remedy. Multiple devices may be installed in rows or patterns to improve continuity and completeness of ventilation. The final resting place of the device becomes a spacer which is open through itself to define and allow an area of air passage while it may hold insulation away from the desired venting location. The device is configured to define and maintain a predetermined vent space between the insulation and the enclosure.



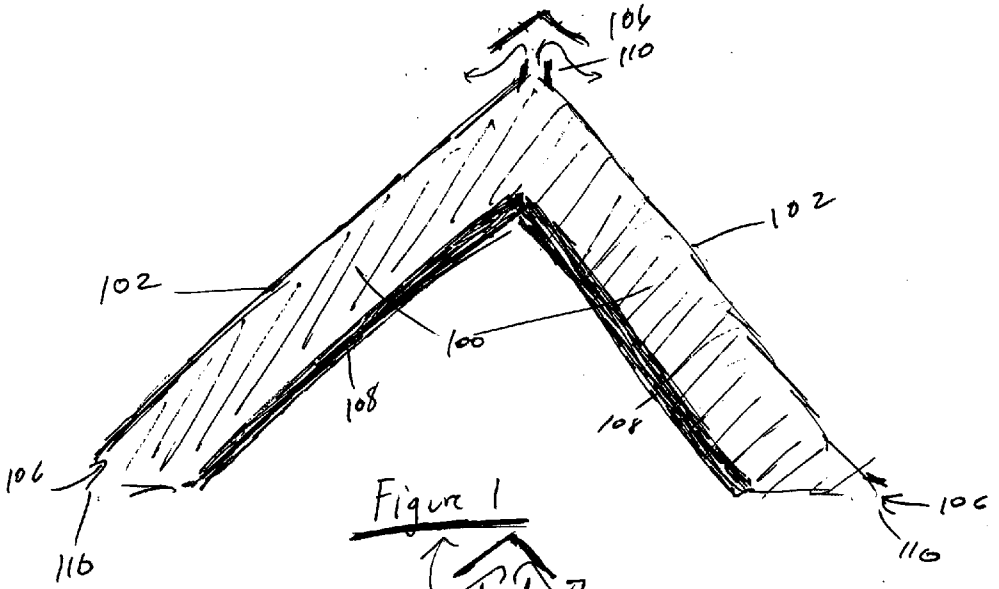


Figure 1

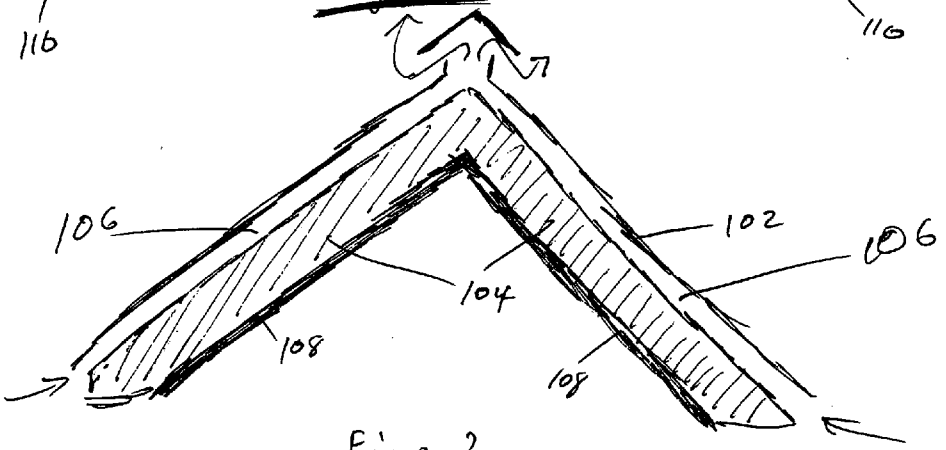
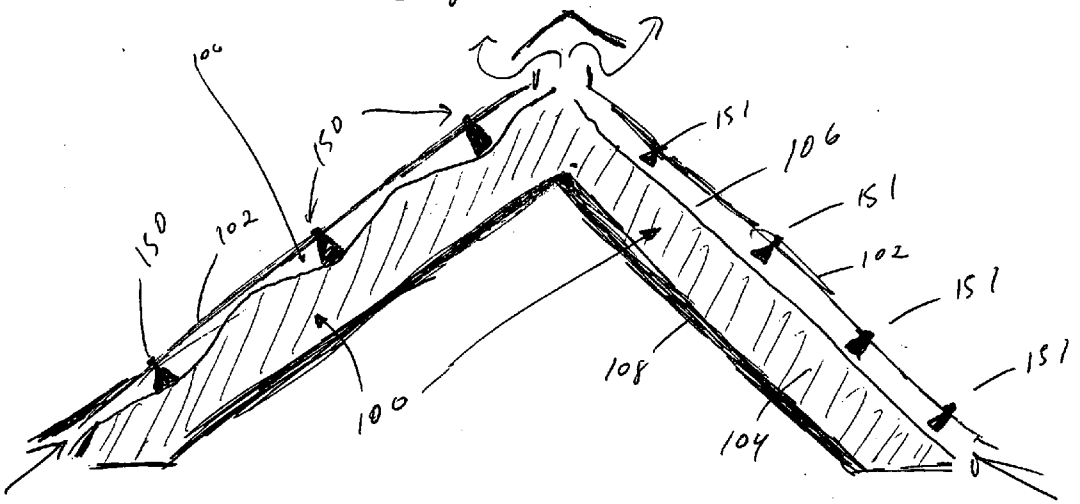


Figure 2



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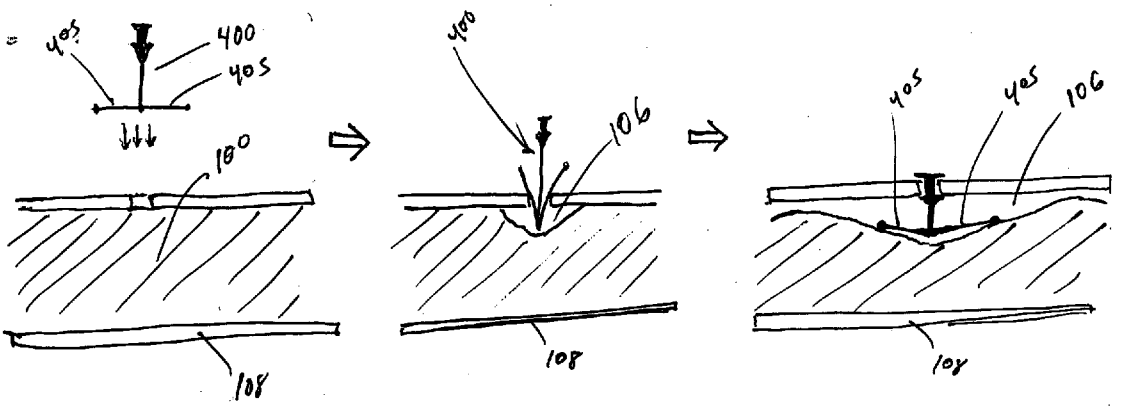

Figure 4

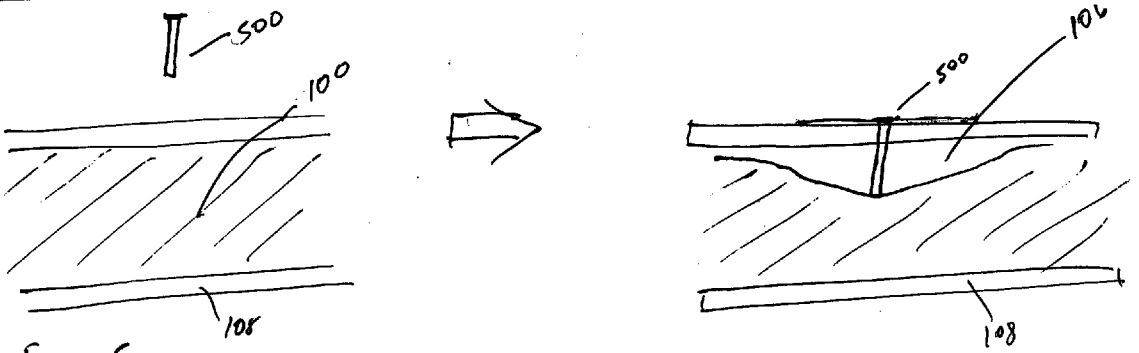

Figure 5

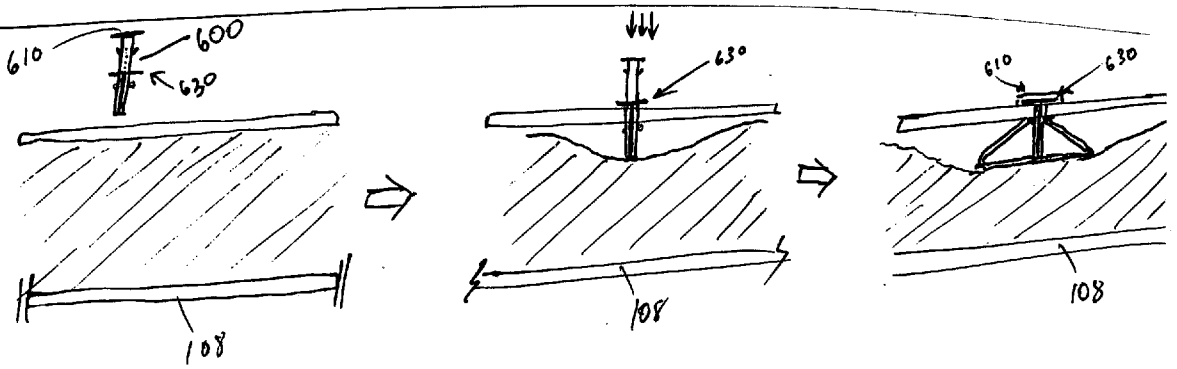

Figure 6

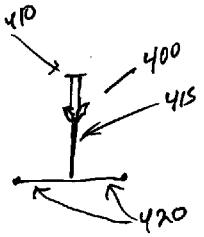

Figure 7

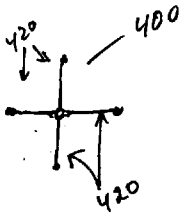

Figure 8

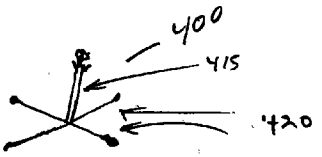

Figure 9

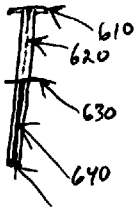

Figure 10

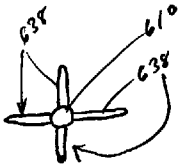

Figure 11

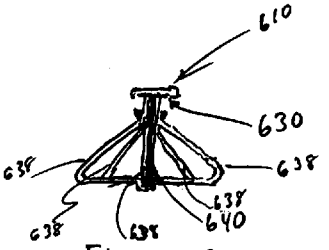

Figure 12

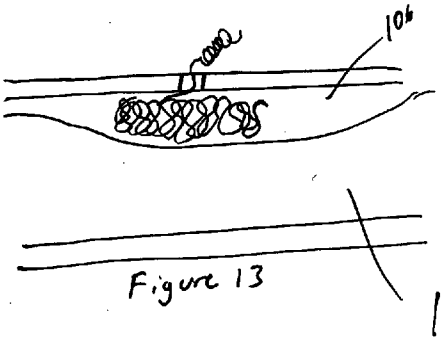

Figure 13

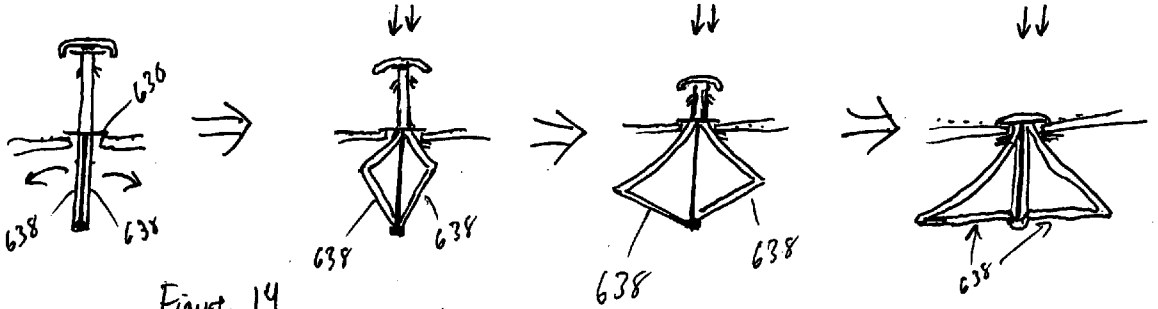

Figure 14

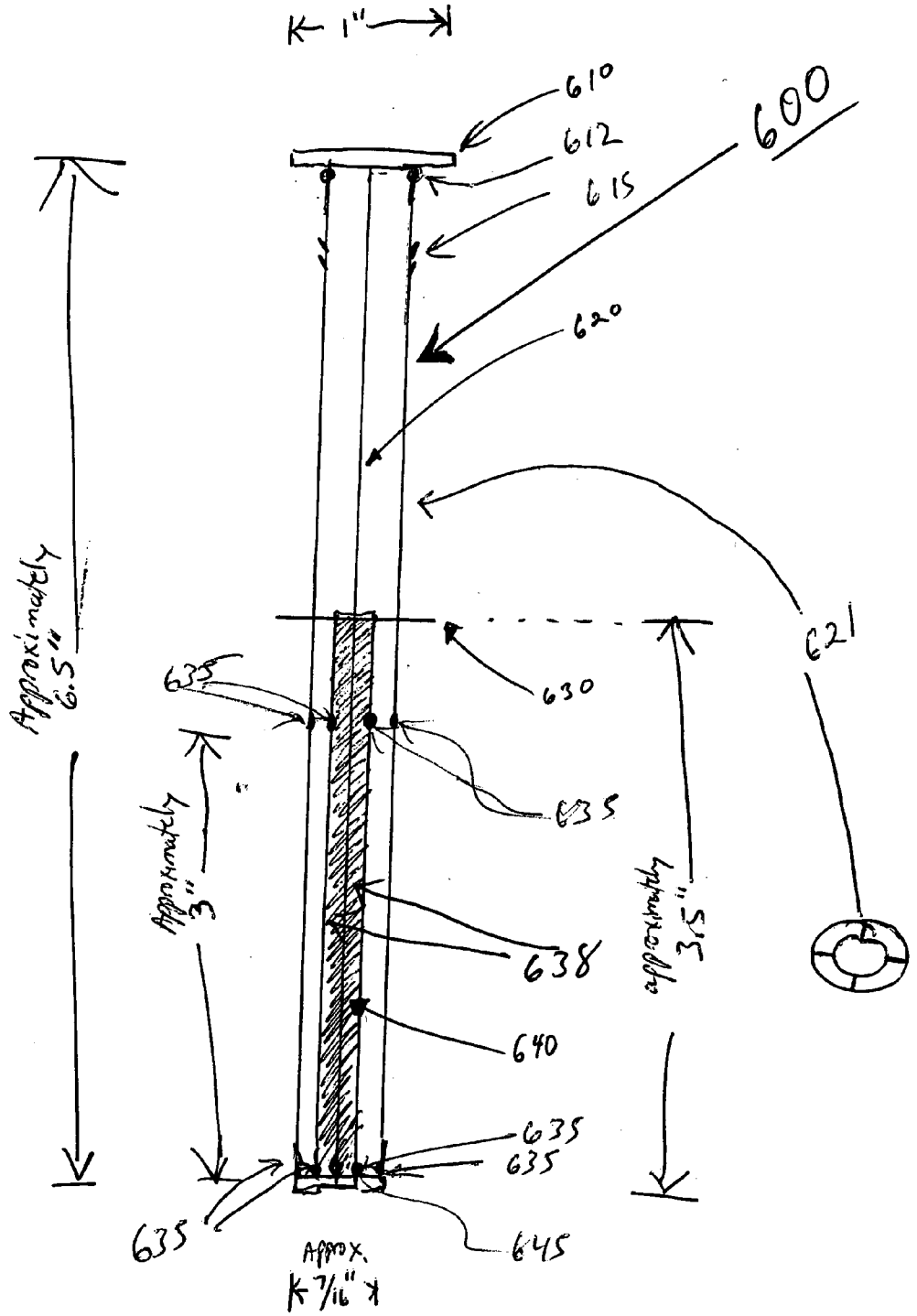
1"
610
612
615
600
620
621
630
635
635
635
638
640
635
635
645
Approx. 6.5"
Approx. 3"
Approx. 3.5"
Approx. 7/16"

Figure 15

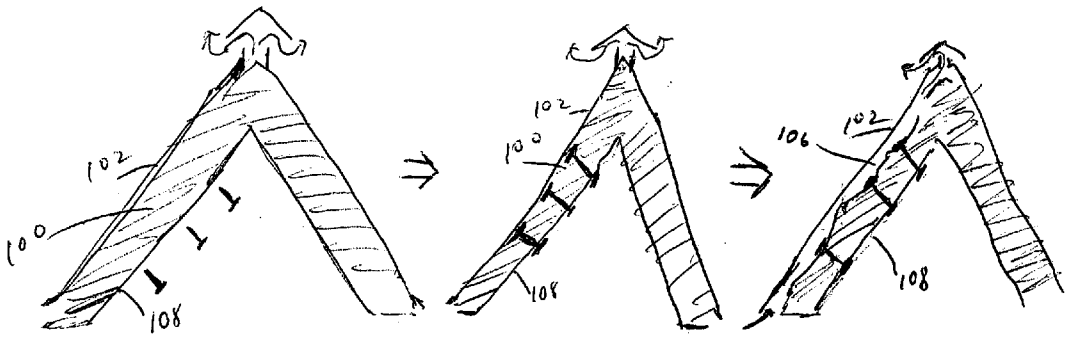

Figure 16

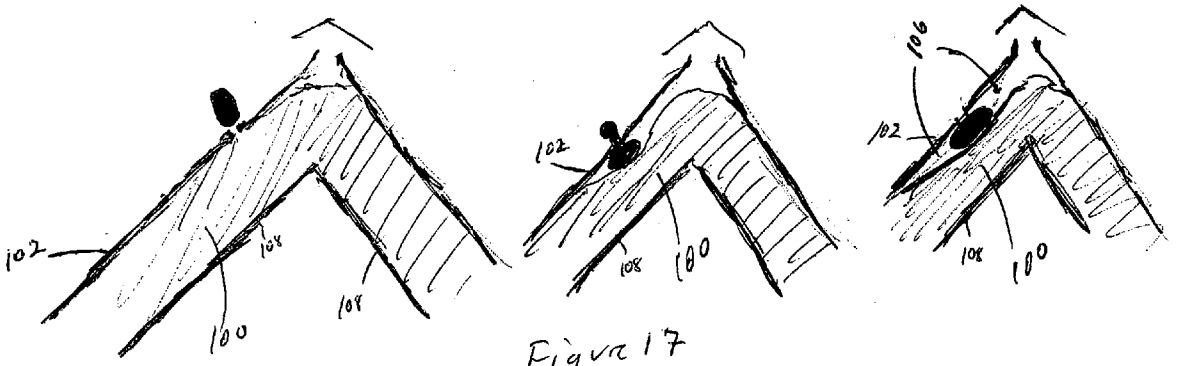

Figure 17

METHOD AND APPARATUS TO IMPROVE OR DEFINE VENTING FROM THE OTHER SIDE OF A STRUCTURE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. provisional patent application Ser. No. 60/780,726, Mar. 8, 2006, entitled Mechanical Insulation Displacement Vent. The entire disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] This document mentions types of materials and types of building structures, but does not limit the invented method and apparatus (also referred to as device) from working successfully on any type of structure, to improve or alter the air space or ventilation on the other side. Typical uses would be on a roof, wall, floor, structure with moisture production within, or any structure.

[0003] It is a generally accepted practice that structures, especially roofs and walls, are best served when the design has included ventilation. It is generally accepted, for example, that all areas of a roof need to be vented in order to avoid related problems such as condensation, rotted wood, bugs, mold and other problems. Ventilation of a roof typically comprises air entering a passive intake vent located at a lower spot on a roof and the air space should be continuous, unobstructed, and connected along the underside of the roof deck to connect to a passive exit vent which is often at a higher point on the roof and is often a ridge vent.

[0004] It is often found that existing, but not limited to, building structures do not have the proper ventilation and a remedy of such internal ventilation is desirable. Often, the continuous air space desired to be at the inner side of the structure's face, has been obstructed by insulation improperly installed too close to the inner side thus blocking or obstructing or eliminating the air space and ventilation. In the case of a typical house, the roof structure may be plywood decking or the like and the desired location of the air space for venting would be immediately adjacent and proximal to the underside or inner side of the wood decking whereby the location of the venting air is between the insulation and the underside of the roof decking. Often it is desirable to have ventilation a complete inch or 2 from the decking, continuously. A venting system works best when the intake air is in continuous communication with the structures venting needs and continuous and connected to exit the exhaust vent; air movement is often desirable and achieved being fueled by the Venturi affect. The heating of the air passively from the structure's warmth often moves the air beneficially since warmer air tends to rise. In a typical ventilated roof, fresh cold air will enter the lower soffit vents and it will travel the vented spaces of the roof and exit a ridge vent.

[0005] Structures which have an open attic, often contain the insulation envelope within the floor of the attic and therefore achieve ventilation of the roof with little consideration and few or no complications because often the underside of the roof deck is open and continuous with the air of the open space of the attic; fulfilling the structures ventilation requirements. Conversely, structures with a cathedral ceiling, have the ceiling up against the roof structure and therefore are often an example of typical ventilation problems and complications.

[0006] In an example of a cathedral ceiling or other structure, often a condition occurs that the insulation has been installed up against or too close to the inner side of a structure thus the insulation may be obstructing or eliminating the air space and the ventilation. The air space may be merely obstructed in certain locations or the air space may be limited or nonexistent due to the presence of the insulation.

[0007] Prior to the advent of this newly invented method and apparatus known as the Mechanical Insulation Displacement Vent, the typical problematic cathedral ceiling venting problem would be difficult, time consuming, and expensive to remedy. In this cathedral ceiling scenario, the inner vented area can not be easily inspected because the roof decking has been installed on one side and the ceiling has been installed on the other side. The ceiling and the roofing impede the worker from being able to easily inspect or remedy the ventilation problem, therefore traditionally the venting remedy may include dismantling of the roofing and roof decking in order to remedy the insulation and the ventilation. Once the ventilation has been remedied, the roof decking and removals would then need to be replaced and rebuilt. The traditional solution of disassemble and reassemble in order to solve ventilation issues, is very expensive, tedious, time consuming and can open the structure to the elements of the weather for extended periods of time.

[0008] In the cathedral ceiling roof venting example, all of the above mentioned work can be avoided by utilization of the invented method and apparatus. Rather than to disassemble the roof structure, the roof worker may utilize the apparatus which will penetrate the roof decking from the outer side of the decking. The installed device will serve to displace insulation at the inner side of the roof decking creating an improved air space whereby air can move through and around the device between the insulation and the inner side of the roof decking. Multiple devices can be installed in patterns or rows to achieve the intended air space and continuity desired. In conclusion, the worker will save time and money because with the new invention, the worker can improve the ventilation located on the inner side of the roof deck without having to dismantle and reassemble the structure.

DESCRIPTION OF THE DRAWINGS

[0009] The invention can be utilized to improve ventilation of a roof, wall, floor or any structure. For the purpose of simplifying, this writing will be descriptive of the application to a roof but, the invention should not be limited to such. FIG. **1** is a cross section view of a roof with typical roof decking **102**, insulation **100**. FIG. **1** shows that the insulation **100** comprises the entire area up to the underside of the roof deck leaving no room for air space for ventilation. FIG. **2** is a cross section view of a roof with insulation **104** with airspace **106**. On FIG. **2**, the insulation **104** is shown that it is not installed to completely fill the cavity because it is installed in a way to provide a void of air space **106** to exist between the insulation **104** and the inner side of the roof decking **102**. Typical ventilation and therefore proper functioning of many building systems, often requires open

air or air movement and air continuity in the space located between the inner side of the sheathing or decking **102** and the insulation. Often, a building will have insulation installed such as insulation **100**, installed encompassing the area of the inner side of the sheathing **102** leaving no effective void for free air space. Such insulation installed with no air space **106** may have ventilation related problems. It is often desirable to have ventilation air space directly at the inner side of the roof sheathing **102** and often desirable to have continuity and fluid air communication from a low point on the roof to connect to an upper part of the roof often called a vent opening **110**. A ventilation related problem may arise when the insulation is obstructing or slowing or resisting the ventilation and the air movement desired. Furthermore, the existing building components, decking **102**, ceiling **108**, and other building components, can make it difficult to even see or access and alter the insulation to add the ventilation to solve the problem. Often, the builder, worker or roofer, in order to define or improve the desired air space or air continuity, the worker must remove roof decking **102** or other building components such as ceiling **108**, in order to gain access to the inner insulated area to inspect or move or confirm or assure that the insulation is not inhibiting or resisting the desired ventilation air space. As described, often, removal of roof decking has traditionally been performed to inspect or remedy the ventilation. Until the advent of this invention, the worker typically would have to spend a large amount of time and use expensive materials to dismantle the roof or wall or other assembly, and rebuild it as needed in order to define, correct, change or improve the ventilation.

[**0010**] The invention, method and apparatus pertains to such conditions when air space ventilation is desirable and may or may not already be present FIG. **1**, but the building components such as the roof decking **102**, insulation **100**, or the ceiling **108** might be obstructing the inspection and obstructing the ability to alter the ventilation or insulation. To avoid having to remove the roof decking **102** or other building components to fix the ventilation, this invented method and apparatus can be used. In one embodiment of the invention, to create air space on the inner side of a roof deck **102** and above the insulation **100**, the user may drill a hole from the outer side completely through the roof decking **102**. The user would then insert the apparatus referred to as the M.I.D.V. which would penetrate to the other side of the roof deck and would serve to push or move or displace the insulation or other material in order to create or simply preserve or define air space for ventilation. For desired results or continuity of air spaces, multiple devices can be installed in rows or patterns. FIG. **3** shows the M.I.D.V. devices **150**, after having been installed in a row, the device has served to define air space by displacing the insulation **100**. In the case of the devices **151**, on the right side of FIG. **3**, the insulation was never obstructing in the first place and the invention **151** served its purpose to define the air space even though the air space **106** was already present; the device may serve to preserve or define air space in such a situation where the air space was already there but inspections could not be performed. Since the insulation and venting requirements are within the structure, they can not be seen and therefore the user may not know the conditions and therefore may simply choose to use the method and apparatus anyway instead of performing costly destructive inspections or alterations or instead of not knowing the ventilation conditions.

[**0011**] FIG. **4** depicts a progression of the method and apparatus in 3 different states moving chronologically from left to right showing a device **400** in state 1 ready to penetrate and then a state two which shows the device in the process of penetrating the structure and then a state 3 in which the device is in its final position and has flexed its multiple wings **405** and displaced insulation or other material defining and improving an airspace. The device snaps to the structure with a cap and barbs to hold it in place. The device may have 4 or more or fewer wings **405** which flex outward after penetration to move or displace matter or define airspace allowing air movement surrounding the openness of its structure.

[**0012**] FIG. **5** depicts a device **500** and a structure with insulation **100** filling the area leaving no void for air space. The figure moves in progression from the drawing on the left to the drawing on the right which depicts an installed penetrating device **500** which has penetrated to the other side of the enclosure and displaced insulation which results in the creation of an airspace **106**.

[**0013**] FIG. **6** shows 3 drawings depicting a process from left to right showing a mechanical cylindrical device **600** with a cap **610** and a stop pin **630**. In the second drawing from the left, the device is in process of penetrating the structure whereby the device has been inserted until the stop pin has hit the structure proximal to the penetration point. In the second drawing, inserting of the device further will require a push downward from the user and the device will be restricted by the stop pin which will not fit through the penetration. When the stop pin is halted, and simultaneously the cap of the devise is being pushed downward, the device is configured that the stop pin **630** acts as a lever actuating the device to expand outward to the shape of the third figure from the left. The stop pin's final position rests on the top portion of the structure and may get concealed by the contour of the cap **610**. The stop pin stops the bottom of the device from penetrating deeper while the force downward on the cap forces the device to bulge or expand to a new outward and downward shape which assists to improve the position of the insulation for venting or other purposes. The device may be comprised of plastic tubing which is sliced longitudinally such that the actuation of the device creates the reshaping of the material which may create the extension of 4 or more or fewer wings which actuate. More on this apparatus s described for FIG. **15**.

[**0014**] FIG. **7** shows the device of the embodiment of FIG. **4** and since it is a side view, you can not see that there may be more than 2 wings **420**.

[**0015**] FIG. **8** shows the apparatus of FIG. **7** and FIG. **4** as a top view.

[**0016**] FIG. **9** shows an isometric or 3 dimensional style view of the embodiment of FIG. **7** and FIG. **8**.

[**0017**] FIG. **10** shows the embodiment of FIG. **6** and FIG. **15** which is a cylindrical apparatus configured to actuate and change shape to a breathable device whose wings and wing movement to the final expanded state may serve to displace material on the other side of a structure as well as may serve to define an air space for venting.

[0018] FIG. **11** is the device of FIGS. **6**, **15** and **10**, shown in an expanded final state, shown from a top view from which you can see the cap **610** and the upper portion of the wings **638**.

[0019] FIG. **12** shows the device of FIG. **11** in the final expanded state attempting to show multiple actuated wings, a stop pin **630** which snaps into a final position and may be shielded by cap **610**.

[0020] FIG. **13** shows a method and apparatus of inserting a thin long apparatus through a hole in a structure such that the final resting shape and position has a final accumulated affect of which creates the predetermined amount of airspace on the other side of the structure displacing insulation **104** and defining or improving airspace **106**.

[0021] FIG. **14** shows the device of FIGS. **6**, **10**, **11**, **12** and FIG. **15**, showing from left to right, 4 different stages of penetration and actuation of the device. Counting drawings from the left, the first drawing shows the device penetrating the structure until the stop pin **630** has come into contact with the structure. The second drawing from the left shows that the stop pin has stopped the bottom or leading edge from penetrating any further thus the stop pin **630** and mechanism transfers the user's downward force to actuate the expansion of the device which is in process in the second picture. The third drawing from the left shows the device further penetrating and further actuating with wings moving in a direction which would be advantageous in the attempt to push or displace or define material or insulation. The fourth picture from the left shows the final resting state of the device which can not back out because of the new shape and because of simple barbs. The mechanism of actuation can be understood by the description for FIG. **15**.

[0022] FIG. **15** shows the device and approximate measurements for a prototype device that can work well. The embodiment **600** has a central portion which may be comprised of pecks plastic ⅜ plumbers tubing which has been configured to include a stop pin **630** which is fixed to a center dowel **640** which is fixed to the leading edge at attachment point **645**. The plastic tube has slices longitudinally that are depicted by cross section view **621**. The longitudinal slices are to create the actuation as the slices create resulting portions which act as the wings when the device actuates to the final expanded state. At predetermined locations **635**, the plastic wing areas are further weakened such that the compression of pressure down on the device causes actuation that expands the plastic portions or wings **638** with hinges or bending or knuckles occurring at the predetermined weakened locations **635**. As the device is actuated, the stop pin **630** is slide-ably engaged in a groove or slice which extends to a predetermined cradle space whereby the pin snaps into place **612** and is shielded by plastic cap **610**. In the prototype model, the cap may comprise a 1" Hitachi Plastitack cap which works well adhered to the top end of the plastic tube.

[0023] FIG. **16** shows a roofing assembly in drawing succession from left to right showing the apparatus in the first drawing ready to be installed in this embodiment, from inside at the ceiling **108**. The second drawing from the left shows the devices at a second state of installation whereby they have accessed a control at the area located near the underside of a roof deck **102**. The third drawing from the left shows the device in a final resting position where the device has changed ad the upper edge of the device has controlled the insulation and displaced the insulation to a final position which defines an improved airspace **106**.

[0024] FIG. **17** shows a succession of drawings from left to right such that the first drawing shows an embodiment of an apparatus in a first state ready to be installed to a penetrating position to improve ventilation at the other side of the structure. The second drawing from the left shows the apparatus of the first drawing, whereby the user has forced the apparatus through the hole by reconfiguring the shape of the apparatus. The third drawing from the left shows the device of picture **1** and **2** having been reconfigured to fit through the hole, and once it penetrates completely through the hole, the hole releases its grip on the device and the device releases potential energy as it flexes back to an enlarged or expanded final state which displaces the insulation **100** and defines and improves an airspace **106**.

[0025] Although several preferred embodiments of the present invention have been described in detail herein, the invention is not limited hereto. It will be appreciated by those having ordinary skill in the art that various modifications can be made without materially departing from the novel and advantageous teachings of the invention. Accordingly, the embodiments disclosed herein are by way of example. It is to be understood that the scope of the invention is not to be limited thereby.

What is claimed is:

1. An apparatus for using or installing a penetrating device from a side of a structure to displace or change insulation or other material located on the other side of a structure to improve or define air space for ventilation or other reasons.

2. The apparatus of claim 1 wherein the apparatus is installed through a hole drilled through the structure and achieves a final position which may displace or change insulation or other material located on the other side of a structure.

3. The apparatus of claim 1 wherein the apparatus penetrates through the structure in a first state and then changes shape to a second state to displace or improve or define a predetermined amount of air space for ventilation or other reasons.

4. The apparatus of claim 1 wherein the apparatus penetrates through the structure in a length-wise fashion because its design is thin in order to penetrate the structure with the least amount of destruction to the structure or through the smallest hole designed such that the device can be fed to penetrate through the structure and rest or accumulate in total size in a fashion to displace or move insulation or other material to improve or define a predetermined amount of air space for venting or other reasons.

5. The apparatus of claim 1 wherein the apparatus is also a fastener which is used both to fasten a material as well as being designed to penetrate the structure and move or displace insulation or other material, to improve or define ventilation air space. The examples the apparatus may fasten may be a roof shingle and a siding shingle and any other material that makes sense to the application and process.

6. The apparatus of claim 1 wherein the apparatus comprises a tube similar but not limited to ⅜" pecks plastic plumbing tubing of a predetermined length and configuration such that as the apparatus penetrates the structure, a pin or other portion gets stopped from insertion by hitting the structure. Since this stop pin, will not fit through the struc-

ture, and the rest of the device is being pushed to penetrate, the stop pin acts as a mechanical lever creating an actuation of the device to change from state 1 to an expanded second state on the other side of the structure. The stop pin is connected to a dowel which extends longitudinally down the center to attach to the bottom edge of the device. When penetrating the structure, the body of the apparatus is being pushed to penetrate and the center of the body is only slide-ably engaged with the dowel and the stop pin but the body is connected to the dowel at the bottom edge so the force downward causes the apparatus to expand sending multiple legs outward in an expanding, outward movement away from the central axis because the length of the device has been forced by the mechanism to shrink in length and that loss of length manifests itself physically to become a predetermined expanded breathable shape or framework which may push the insulation or other material in a direction predominantly away from the structure being penetrated. When the device is pushed to penetrate, the stop pin slides in a groove through the center of the cylindrical device and when the top edge lengthwise of the device has been penetrated to reach the surface of the structure, the stop pin will click into a prearranged stop position whereby the stop pin may then be shielded by the cap of the apparatus. Once the device is resting in its final stage, the cap may keep the device from penetrating too deeply while also serving to cover the stop pin. Barbed material may keep the apparatus from backing out of the final resting position.

7. The apparatus of claim 7 wherein the device is of similar design and function and is manufactured of all of the same or similar material in a effective and efficient manufacturing process in which the apparatus may comprise one of plastic and one of metal and one of wood and similar materials and one of a combination thereof.

8. The apparatus of claim 1 wherein the apparatus is configured to be as small in cross section as possible as it penetrates the structure to be the least damaging as possible to the structure but once on the other side, the apparatus is configured to change shape to an expanded second state such that the movement to the second state may be in a direction congruent with the intention of displacement of the insulation or material and eventual resting shape and size are congruent with intentions to improve or define ventilation.

9. The apparatus of claim 1 wherein the device enters the smallest practical hole in the structure and once it has penetrated through the deck, the apparatus naturally releases its potential energy as it flexes back to an expanded predetermined larger and more stable final state and shape. An example of a product with such expansive capabilities might be microfilaments or entangled rigid plastic net filaments used commonly as breather vents.

10. The apparatus of claim 1 wherein the device enters the smallest practical hole as a very thin item with frontal wings which are bent from the bottom or lead edge backward towards the rear in order that its cross section view is small that it may fit through a small nondestructive hole. Once the leading edge of the apparatus and tips of the wings have penetrated completely through the hole and are no longer restricted by the hole, the wings may release potential energy and flex or move to a second expanded state which the wings are positioned more perpendicular to the longitudinal shape. This device gets pushed completely into place and may attach or embed or fixate to the structure proximal to the penetration and one embodiment may have a loose resting place and may stay in place because of the new final shape.

11. The apparatus of claim 1 wherein the apparatus comprises one of a plastic, and one of a metal, and one of a wood material.

12. A method of improving or defining ventilation of a structure whereby an apparatus is penetrated through the structure such that the apparatus penetrates to the other side of the structure and may serve to move or displace or define the position of insulation or other material located on the other side of the structure in order to displace said material to improve or define air space for ventilation or other reasons.

13. The method of claim 12 further comprising the step of creating a workable hole for the apparatus to achieve the penetration.

14. The method of claim 12, further comprising performing the method multiple times with multiple of the devices in order that the apparatuses are installed in a row, rows, or patterns to improve or define ventilation such that the devices have a cumulative venting affect and may define a vented area that together, the summation of those items may define a larger area that may be continuous and may form a ventilation system which may have an intake and an exhaust vent in communication with the structure's venting needs.

15. The method of claim 12 further comprising the step that the apparatus may be installed through roofing or siding or other material and the method may also accompany a method of repairing and sealing the destruction to the roofing or siding made by the method and apparatus. For example, the device may be installed through roof material and then sealed so that it does not leak or for other reasons.

16. The method of claim 12 further comprising that the method is performed in response to the fact that the ventilation of the structure can not be inspected because of the enclosure of the structure and the fact that the internal venting can not be seen, therefore the method may be used to define the ventilation in lieu of the inspection and the unknown venting conditions.

17. The method of claim 12 further comprising that a hole may be created in order for the intended penetration of an apparatus further comprising that the user may utilize that hole in order to inspect by viewing through the hole to the other side prior to the installation of the apparatus.

18. The method of claim 12 further comprising that the item which is penetrating to affect the change to the insulation or define the ventilation is one comprised of a gas and one comprised of a liquid and one comprised of sound waves and one comprised of vibration waves.

19. The method of claim 12 further comprising a method of installation from the heated side of the structure.

20. The method of claim 12 further comprising a method of inserting an apparatus comprised of a plastic material such as one of microfilaments and one of entangled rigid plastic filaments and one of a similar product to that of U.S. Pat. Nos. 4,212,622 and 4,252,590.

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