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**Manasterski et al.**

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(54) **HIP VENT**

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**Related U.S. Application Data**

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(51) **Int. Cl.**
***E04D 13/17*** (2006.01)
***F24F 13/08*** (2006.01)

(52) **U.S. Cl.**
CPC ..... ***E04D 13/174*** (2013.01); ***E04D 13/176*** (2013.01); *E04D 13/17* (2013.01); *F24F 13/08* (2013.01)

(58) **Field of Classification Search**
CPC ..... E04D 13/176; E04D 13/174; E04D 1/36; E04D 13/0477; E04D 2013/045; F24F 7/02
See application file for complete search history.

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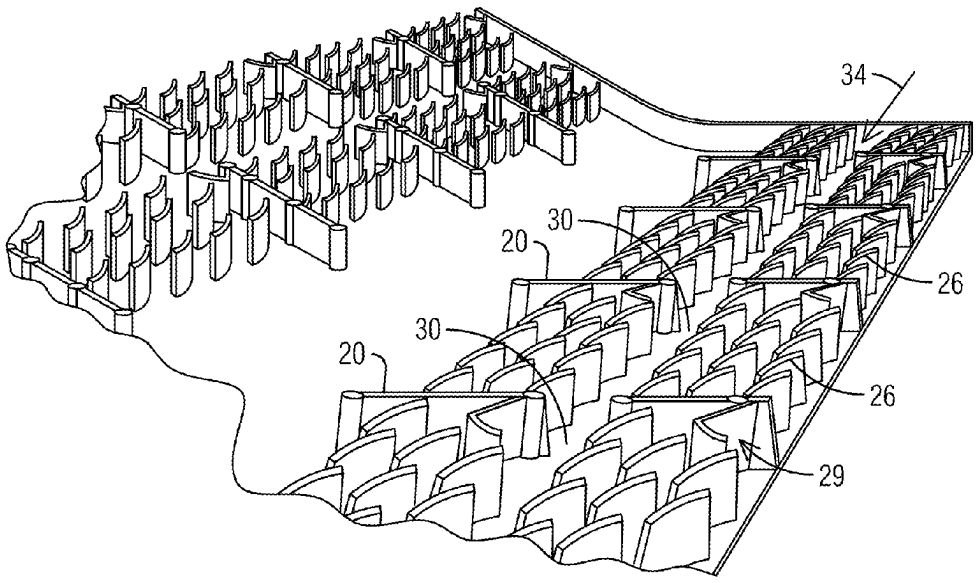
(57) **ABSTRACT**

A vent is disclosed for use in ventilating attic spaces beneath a hip roof. The vent is configured to be installed along a hip of the roof overlying and covering a ventilation slot. The vent includes an elongated laterally flexible top panel from which baffle arrays depend. The baffle arrays include a plurality of curved vanes that arc away from the slot. The vanes are configured to redirect wind-blown rain and snow away from the slot and block the migration of rain and snow through the vent. Filler strips can be attached beneath the edge portions of the vent. The filler strips conform to underlying shingles when the vent is installed to fill gaps that might be formed between the vent and the shingles. A weather filter can be positioned over some of the baffle arrays to allow attic air to pass but prevent ingress of blown snowflakes and raindrops.

**7 Claims, 7 Drawing Sheets**



**Related U.S. Application Data**

continuation of application No. 16/943,192, filed on Jul. 30, 2020, now Pat. No. 11,428,010, which is a continuation of application No. 14/561,432, filed on Dec. 5, 2014, now Pat. No. 10,731,351.

(60) Provisional application No. 61/912,823, filed on Dec. 6, 2013.

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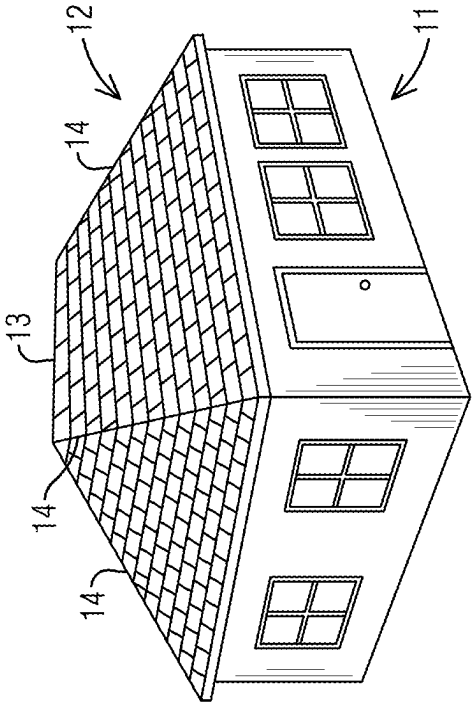


FIG. 1

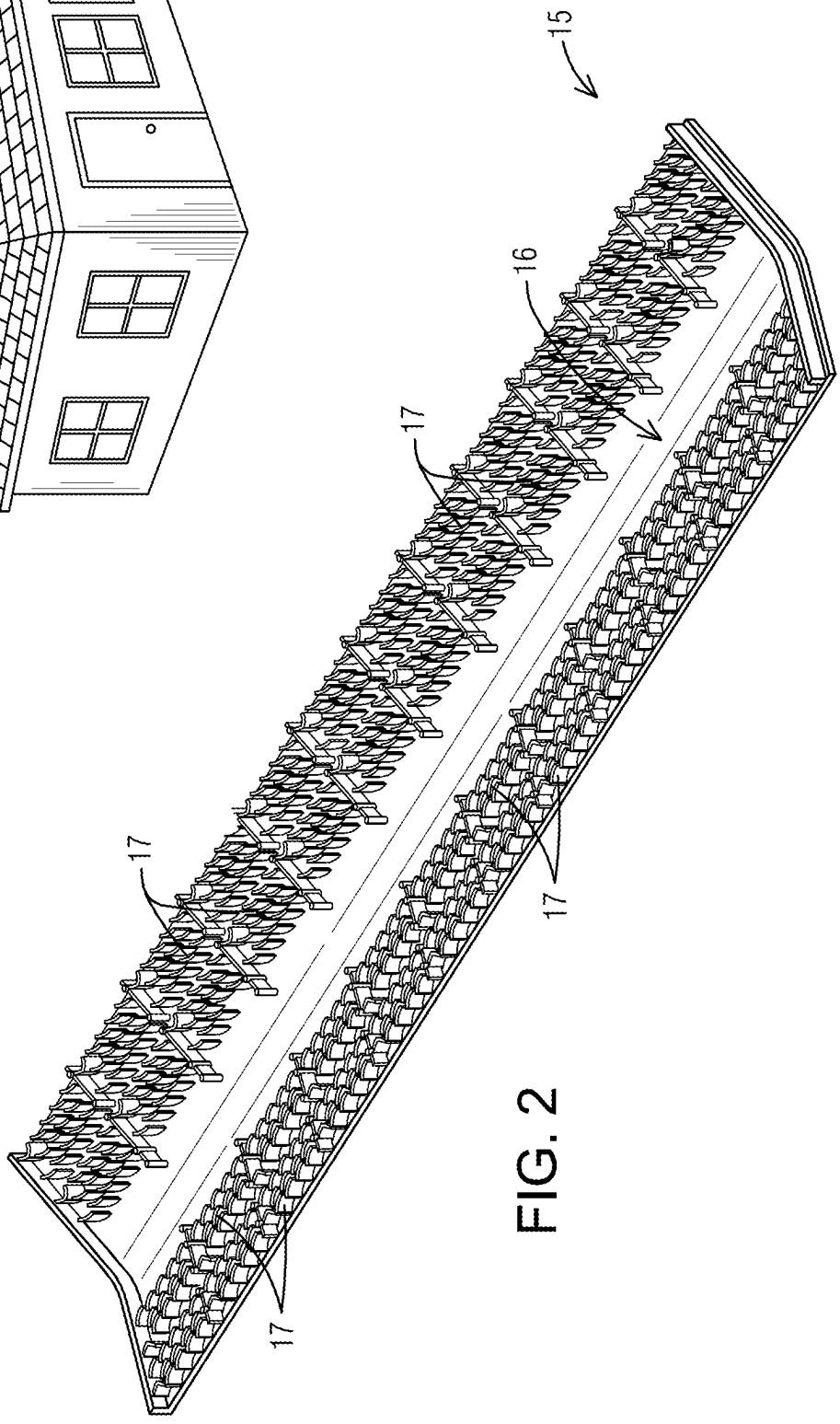


FIG. 2

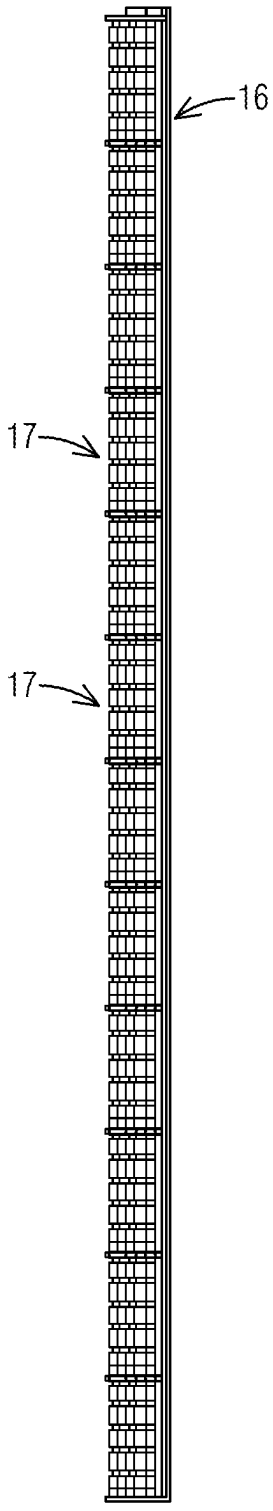


FIG. 3a

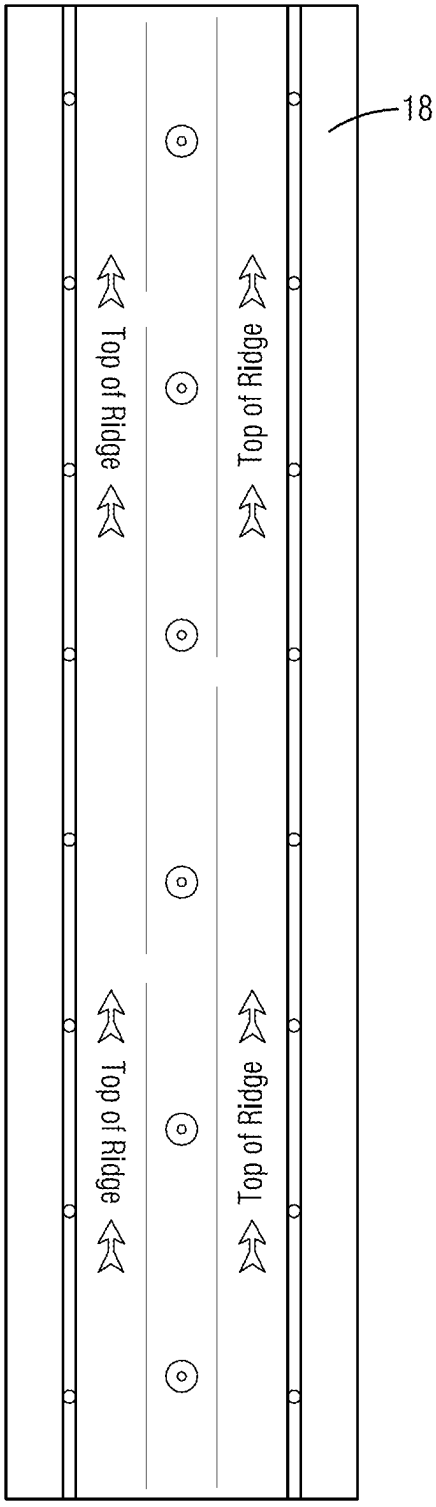


FIG. 3b

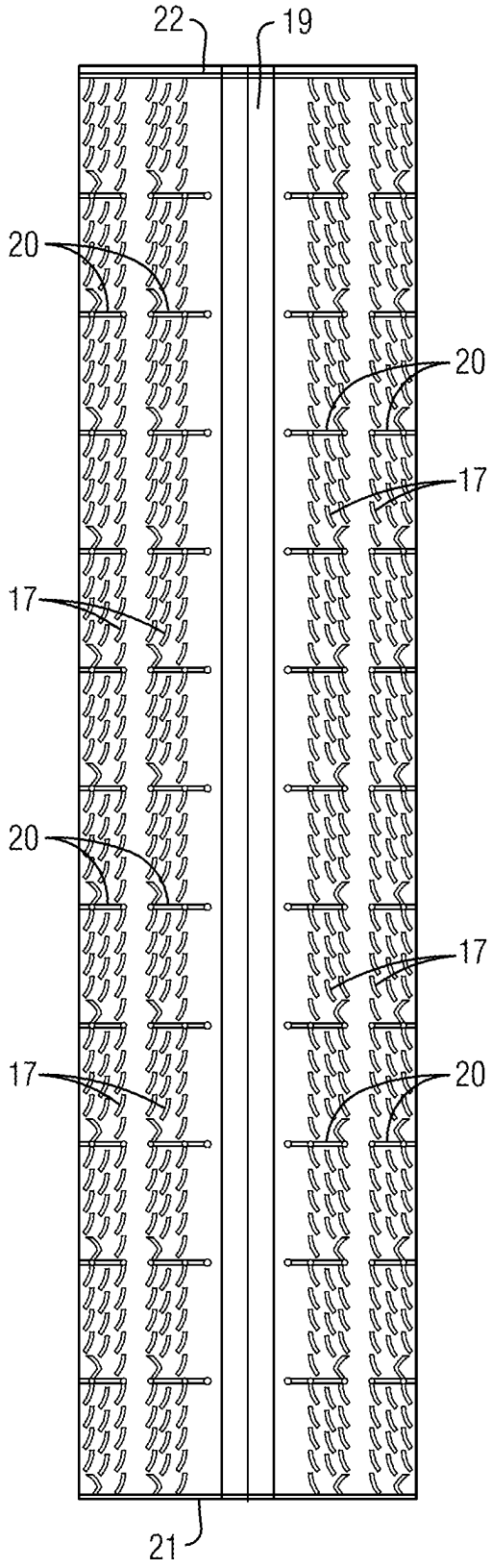


FIG. 3c

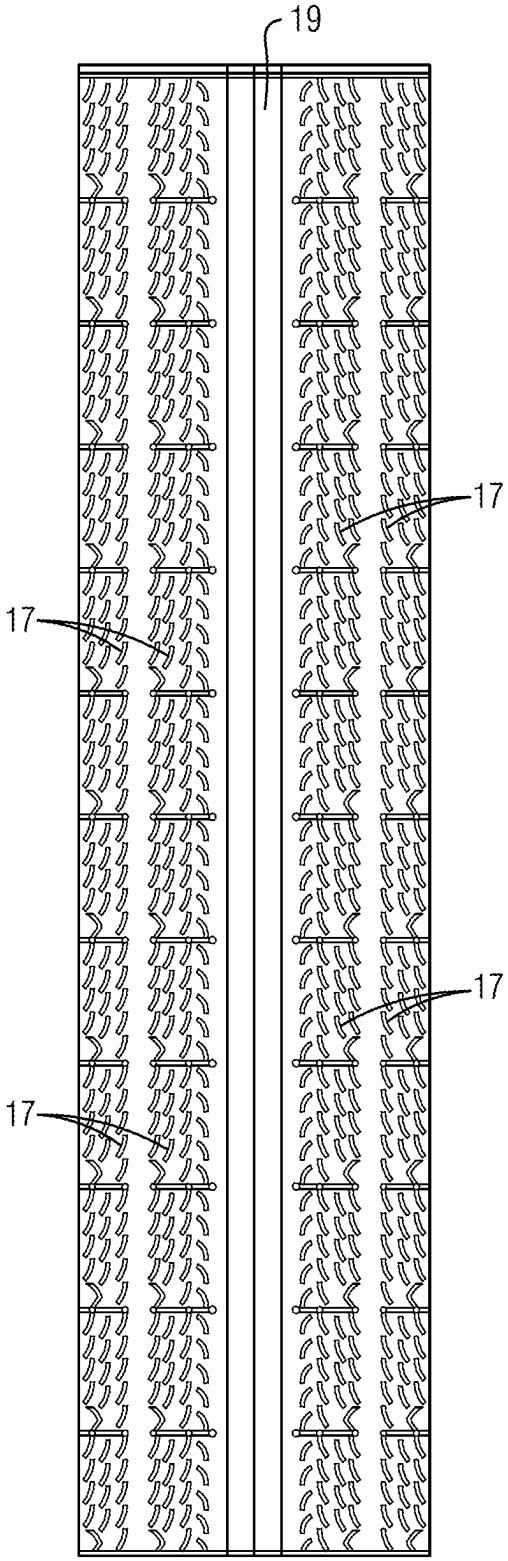


FIG. 4

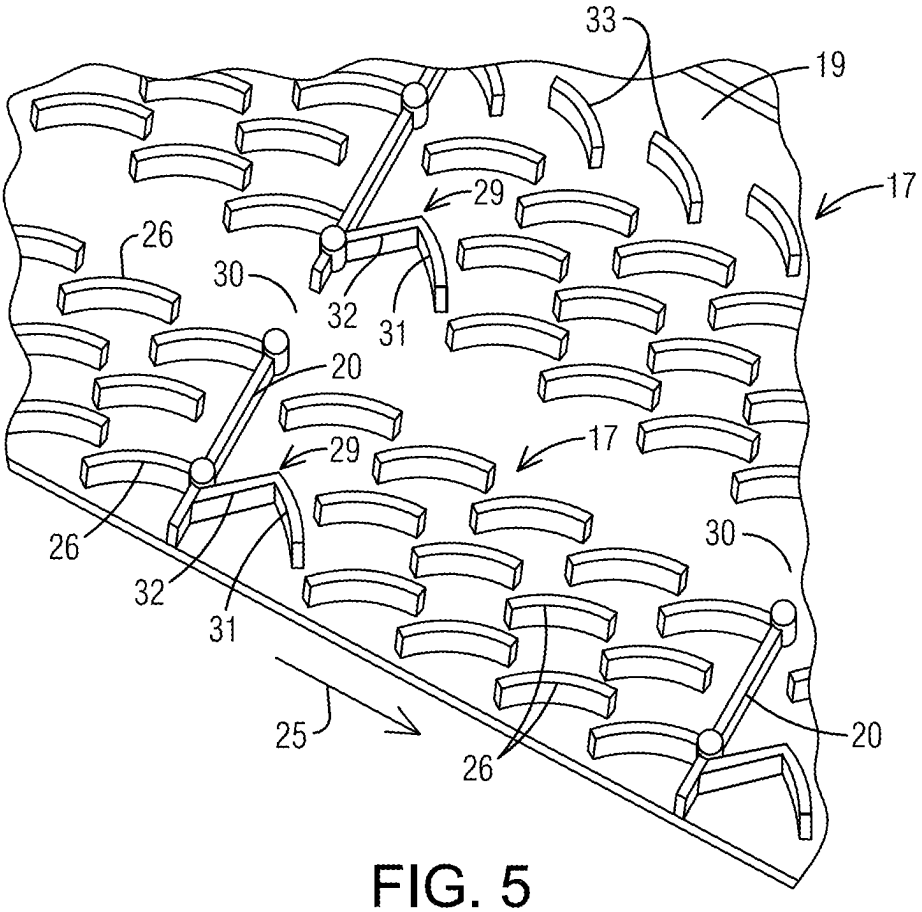


FIG. 5

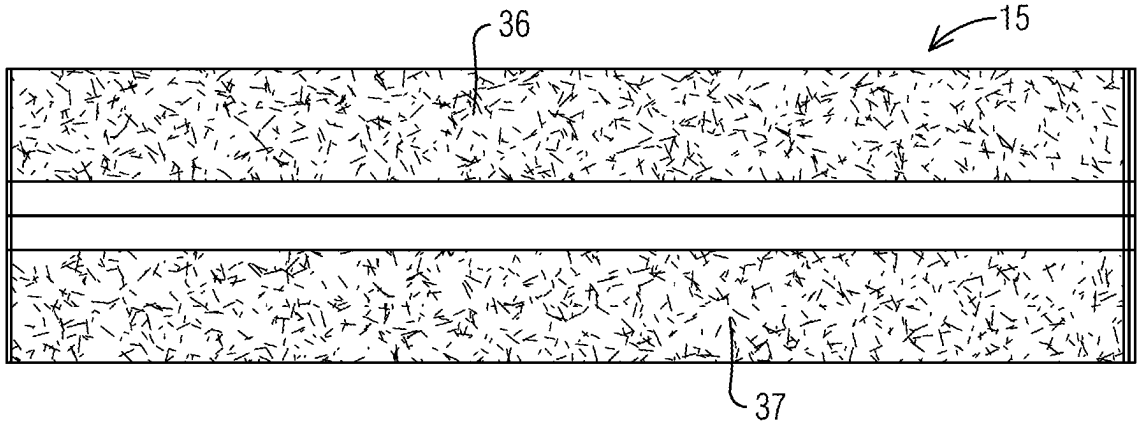


FIG. 6

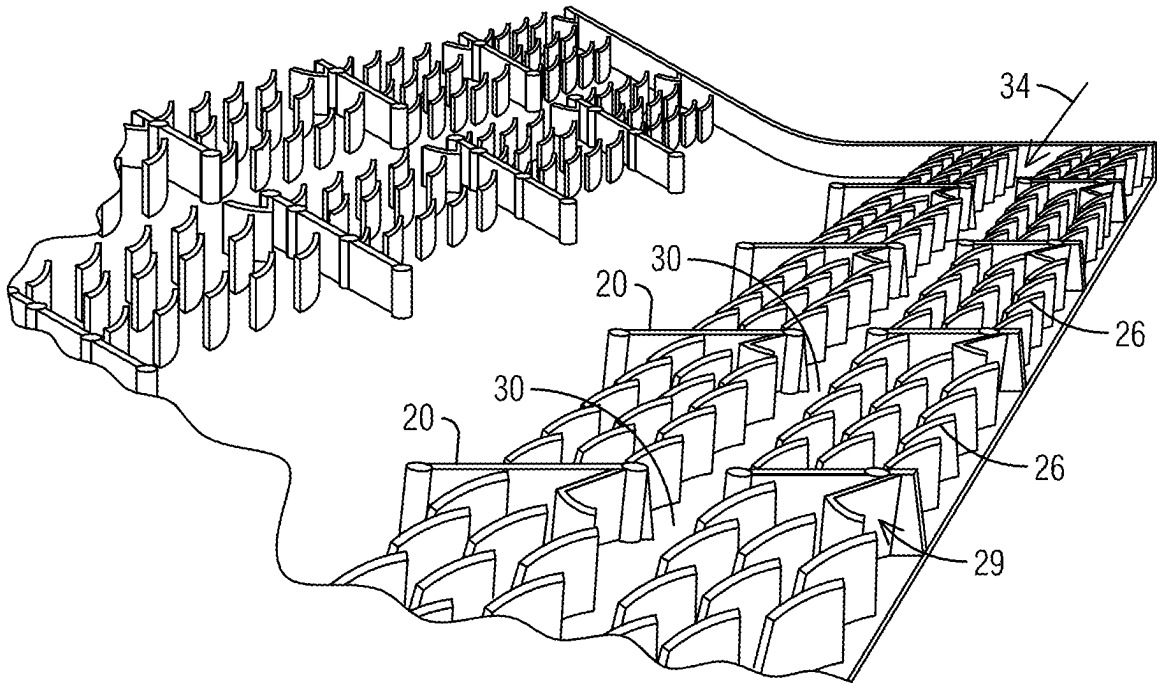
34
30
20
26
30
20
26
29

FIG. 7

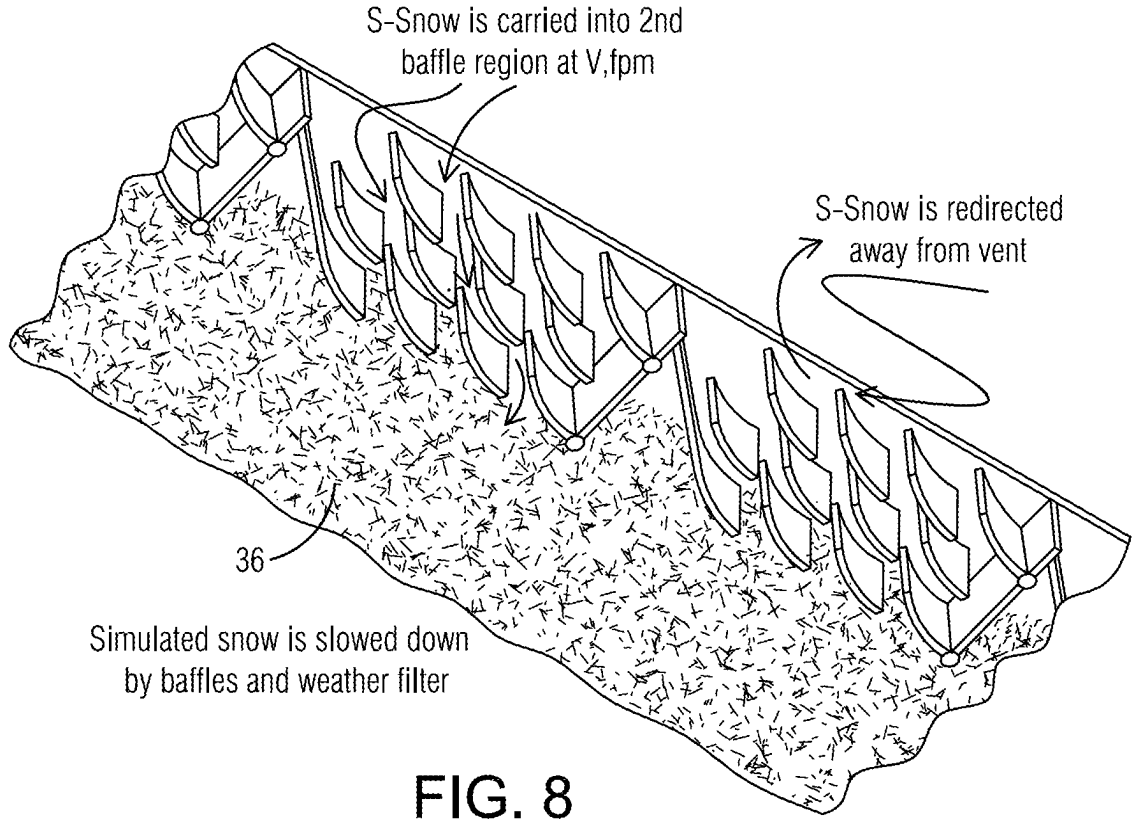
S-Snow is carried into 2nd baffle region at V,fpm
S-Snow is redirected away from vent
36
Simulated snow is slowed down by baffles and weather filter

FIG. 8

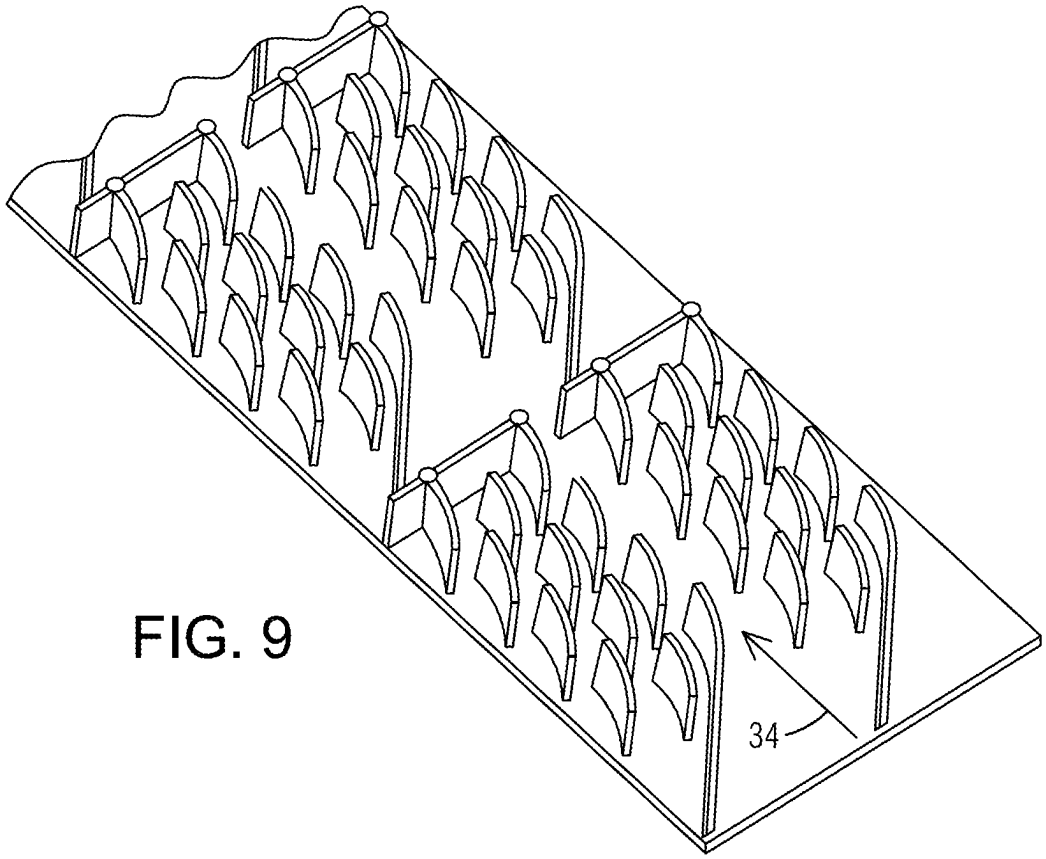


FIG. 9

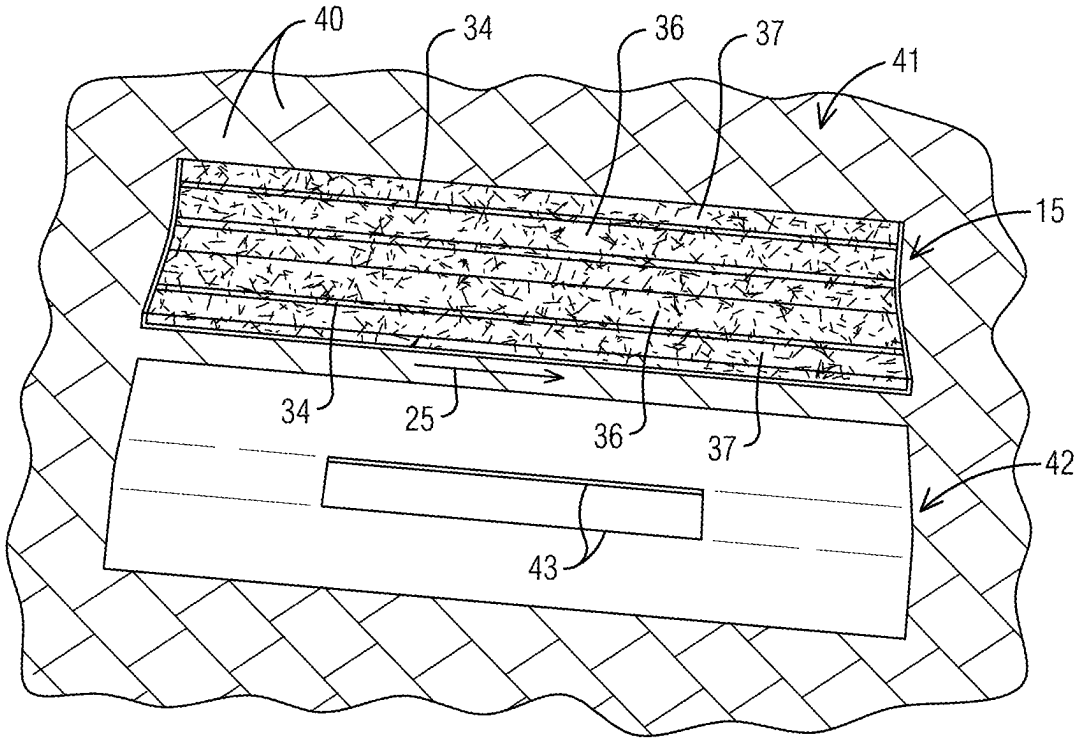


FIG. 10

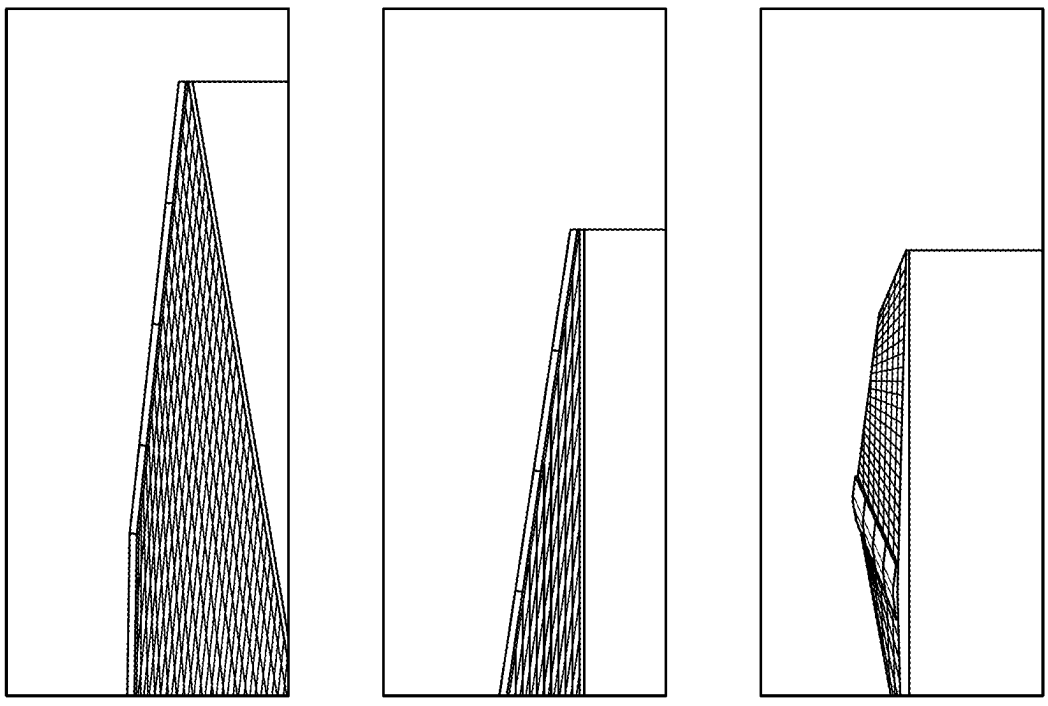
45°
WDR-@45°
W + R Velocity
Infiltration
35 MPH
0 ml
70 MPH
0 ml
90 MPH
0 ml
110 MPH
0 ml
90°
WDR-@90°
W + R Velocity
Infiltration
35 MPH
0 ml
70 MPH
0 ml
90 MPH
0 ml
110 MPH
-20 ml
0°
WDR-@0°
W + R Velocity
Infiltration
35 MPH
0 ml
70 MPH
0 ml
90 MPH
0 ml
110 MPH
-25 ml

FIG. 11

# HIP VENT

## CROSS REFERENCE TO RELATED APPLICATIONS

The present patent application is a continuation of previously filed, co-pending U.S. patent application Ser. No. 17/896,807, filed Aug. 26, 2022, which is a continuation of U.S. patent application Ser. No. 16/943,192, filed Jul. 30, 2020, now U.S. Pat. No. 11,428,010, issued on Aug. 30, 2022, which is a continuation of U.S. patent application Ser. No. 14/561,432, filed Dec. 5, 2014, now U.S. Pat. No. 10,731,351, issued on Aug. 4, 2020, which priority is hereby claimed to the filing date of U.S. Provisional Patent Application No. 61/912,823 entitled Hip Vent, which was filed on Dec. 6, 2013.

## INCORPORATION BY REFERENCE

U.S. patent application Ser. No. 17/896,807, filed Aug. 26, 2022, U.S. patent application Ser. No. 16/943,192, filed Jul. 30, 2020, now U.S. Pat. No. 11,428,010, issued on Aug. 30, 2022, U.S. patent application Ser. No. 14/561,432, filed Dec. 5, 2014, now U.S. Pat. No. 10,731,351, issued on Aug. 4, 2020, and U.S. Provisional Patent Application No. 61/912,823, filed Dec. 6, 2013, are specifically incorporated by reference herein as if set forth in their entireties.

## TECHNICAL FIELD

This disclosure relates generally to attic ventilation and more specifically to shingle-over vents for installation along a hip and/or along a ridge of a shingled roof.

## BACKGROUND

Ridge vents and hip vents for ventilating a shingled roof have been known and used for many years. Such vents generally are installed along a ridge or along a hip of a roof covering a pre-cut ventilation slot to the attic below. It is inherently more difficult to seal a hip slot against ingress of blowing rain and snow because, among other reasons, of the angled nature of the hip and the angled down-slope directions away from the hip. Hip vents available in the past have had various inherent problems in this regard, particularly when it comes to their ability to prevent water infiltration beneath the vent and into a ventilation slot below.

One prior art hip vent for instance features an intricate baffle and foam insert design to block weather from entering the hip slot. Due to its intricate design and water protection features, it provides for low ventilation of the attic space below. Also, during installation of the vent, large gaps can result between the vent and the varying profile of hip cap and adjacent shingles. This is particularly true for roofs covered with architectural shingles, which are highly textured and exhibit large variations in thickness. According to the prior art, these gaps must be filled with caulking to provide a sufficient seal between the plastic base of the hip vent and the shingles in order to prevent water infiltration. For hip roofs shingled with high profile thick shingles, the amount of caulking required to seal the system can be very large and can actually promote leakage over time or if not carefully applied and maintained. Also, the high profile (i.e. the thickness) of this prior art vent does not provide for an aesthetically pleasant hip roof.

Another prior art hip vent features a blade or fin arrangement intended to provide seal between the vent and the underlying shingles along the hip of a roof. However, the fins alone do not completely seal between the hip vent and the shingles below and extensive amounts of caulking can still be required to obtain a good seal. A third prior art hip vent features a design that allows for little ventilation of attic space below due to its having very limited NFA (Net Free Area). This design also requires large amounts of caulking to prevent water infiltration into a hip slot beneath the hip vent.

A need exists for an attic vent usable along the hip of a hip roof that is easily installable without the need for caulking, even for roofs with thick profiled architectural shingles; that provides for a low profile (i.e. a thinner) aesthetically pleasing vent when installed; and that effectively redirects wind-blown water and snow thereby preventing water and snow penetration beneath the vent, even during blowing rain or blowing snow. It is to the provision of such a hip vent, which also may be used as a ridge vent if desired, that the present invention is primarily directed.

## SUMMARY

A low-profile shingle-over hip vent is disclosed for installation along the hips of a hip roof covering a ventilation slot cut along the hip to the attic space below. The hip vent and ventilation slot below provide attic ventilation on hip roofs where there are no or inadequate horizontal ridges along the top of the roof to provide the desired ventilation. The hip vent includes baffle arrays, filler strips, and a weather filter that provide maximum resistance to infiltration of rain and snow while the hip vent itself remains thin and aesthetically pleasing on the finished roof. The need for extensive caulking is eliminated, which reduces further the chances of leakage if the calking is not applied correctly or deteriorates over time. These and other features, aspects, and advantages will become more apparent upon review of the detailed description set forth below taken in conjunction with the accompanying drawing figures, which are briefly described as follows.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective illustration of a home with a hip roof showing the hip areas extending downwardly from the ridge of the roof to the bottom corners of the roof.

FIG. **2** is a perspective bottom view of a hip vent section that embodies principles of the invention in one preferred form.

FIGS. **3***a*-**3***c* show a side, top, and bottom view respectively of the hip vent shown in FIG. **2**.

FIG. **4** is a more detailed bottom plan view of the hip vent of FIGS. **2** and **3** showing various elements of the weather resistant baffle array structure.

FIG. **5** is an enlarged view of a portion of the bottom of the hip vent of FIG. **4** illustrating more details of the baffle array structure.

FIG. **6** is a bottom plan view of a hip vent according to the invention showing a pair of bottom filler strips attached thereto according to an embodiment thereof.

FIG. **7** shows a portion of the underside of the hip vent of this invention seen from another angle and further illustrating the baffle array.

FIG. **8** is a perspective enlarged view of one edge of the hip vent showing a preferred method of attaching an air permeable weather filter to the bottom portion of the hip vent.

FIG. **9** is a perspective enlarged view of a portion of the bottom of the hip vent illustrating the weather filter weld area where the weather filter is attached.

FIG. **10** shows a hip slot formed along a roof hip and a hip vent according to the invention lying next to the slot upside down with its weather filter attached.

FIG. **11** illustrates the results of wind-blown rain testing of the hip vent of this invention and illustrates the vent's exceptional resistance to water penetration under severe storm conditions.

## DETAILED DESCRIPTION

Reference will be made throughout the following detailed description to the annexed drawing figures that are briefly described above.

FIG. **1** shows a building **11**, a residential home in this case, having a hip style roof **12**. The hip roof in this embodiment has a horizontally extending ridge **13** and four hips **14** that extend downwardly from the ends of the ridge to the lower corners of the roof. In such a roof, the extent of the ridge **13** is insufficient to provide the required amount of ventilation for the attic space below or to match the ventilation area of corresponding eave vents. Accordingly, additional ventilation can be provided by cutting vent slots along the hips **14** and applying hip vents over the vent slots.

The hip vent of the present invention is configured to be installed along the hips **14** covering a hip slot formed therealong to provide ventilation of an attic space below the roof. FIG. **2** shows the hip vent of this invention from the bottom side thereof. The hip vent **15** preferably is made of injection molded plastic and generally comprises a laterally flexible top panel **16** with baffle arrays **17** projecting from the underside of the panel along its edge portions. The baffle arrays are comprised of arcuate vanes and walls, which will be described in more detail below. Generally, the vanes are configured to allow attic air to pass out while redirecting windblown rainwater and snow away from the vent and thus to preventing rainwater and snow from entering the attic through the hip slot below the hip vent **15**. As detailed below, provisions also are made according to the invention for preventing insects and debris from entering the attach beneath the installed hip vent. The hip vent **15** preferably is provided in standard lengths such as four feet and includes features at its ends for attaching the vents together end-to-end to form longer runs of hip vent.

FIGS. **3***a*-**3***c* show, from left to right, an edge view of the hip vent of the invention, a top plan view of the hip vent, and a bottom plan view of the hip vent. The laterally flexible top panel **16** and depending baffle arrays **17** can be seen in the edge view as they would be presented to windblown rain or snow on a roof. The vent is substantially thinner than prior art hip vents to provide a more aesthetically pleasing low profile appearance on a roof. This is particularly important for ridge vents, which can be more visible from a distance than a traditional ridge vent. The top view of FIG. **3***b* illustrates the upper surface **18** of the laterally flexible top panel **16**, which may be embossed with various lines, nailing locations, and indicia to aid an installer during installation of the hip vent.

The bottom view of FIG. **3***c* illustrates the lower surface **19** of the laterally flexible top panel **16** and again shows the baffle arrays **17** and barrier walls **20** extending along the left and right edge portions of the panel. The barrier walls **20** separate the baffle arrays from each other, form wind brakes, and are configured to rest on a shingled roof below to support the hip a predetermined distance above the roof. Weather barriers **21** and **22** may be provided at the ends of the hip vent extending downwardly from the top panel **16** to prevent infiltration of rain water from the ends. Mating connector structures also may be provided on the ends so that a plurality of hip vents can be installed in end-to-end relationship and will be water resistant at their junctions. FIG. **4** also shows the bottom of the hip vent with the lower surface **19** and baffle arrays **17** visible.

FIG. **5** illustrates one preferred embodiment of the baffle arrays of the hip vent, which are designed with an aerodynamic shape to deflect rainwater away from the vent and onto the sloped roof when installed. The vanes also are configured to help prevent wind-blown rain from blowing through the baffle arrays and leaking into an attic space through the ridge slot. In FIG. **5**, the down slope direction when the hip vent is installed is indicated by arrow **25**. Each of the baffle arrays **17** comprises a plurality of curved vanes **26** that arc downwardly and outwardly when the hip vent is installed on a roof. The arcuate vanes of each array are spaced relative to each other so that no straight uninterrupted path is formed from the outside edge of the hip vent through the array of vanes. Further, the lower ends of the vanes in each row of vanes overlap slightly the upper ends of the next downslope vane of the row. In this way, water that may seep or be blow past the lower end of one vane is likely to encounter the next downslope vane and be shed away from the hip vent by that vane. Vanes **33** are arranged along the inner edge of the inner array.

Each baffle array **17** is bounded at its upslope end by a barrier wall **20** and bounded at its downslope end by a barrier wall **20**, each of which extends generally transversely relative to the hip vent. These barrier walls enhance the structural integrity to the hip vent, provide wind brakes between the baffle arrays, and help to support the vent and prevent it from collapsing when installed on a hip roof with nails or other fasteners. Each of the barrier walls **20** comprises an inner portion adjacent the center of the central panel and an outer portion adjacent the edges of the central panel. The inner and outer portions of the barrier walls are separated by gaps **30** for purposes described in more detail below.

The outermost and lowermost vane **29** of each baffle array in this embodiment has an arcuate portion **31** that is oriented substantially transverse to the orientations of the arcuate vanes **26** and a straight portion **32** that extends from the inner end of the arcuate portion **31** to connect integrally to the barrier wall **20**. This insures that there is no free path for water to be blown beneath the hip vent along the upslope sides of the barrier walls. The downslope sides of the barrier walls have arcuate vanes **27** integrally connected to and extending therefrom so that no path for water is formed along the downslope sides of the barrier walls either.

FIG. **6** illustrates another aspect of the hip vent **15** of the present invention; namely, a pair of filler strips **37** is attached to and extend along the bottoms of the baffle arrays. The filler strips are constructed of a spongy conformable material such as a mat of non-woven polymer strands, foam, or other material that is sufficiently conformable to a surface. When installing the hip vent **15** along the hip of a roof, gaps can result between the shingles of the roof and the bottoms baffle arrays. This is particularly true for roofs shingled with highly textured and layered architectural shingles, which are popular among homeowners. Rainwater and snow can be blown through these gaps and can leak through the hip slot into the attic below. The filler strips **37** address this issue by conforming to the uneven top surfaces of the shingles on either side of the hip when the hip vent is installed. Any

would-be gaps are thus filled by the filler strips to block rainwater from seeping through. An additional advantage of the filler strips is that, unlike prior art hip vents, no caulking is required during installation to fill gaps between the hip vent and the shingles of the roof. This eliminates installation errors and erosion over time that can result in leaks.

As perhaps best shown in FIG. **7**, the baffle arrays **17** are arranged along each edge portion of the hip vent in two rows that are spaced apart from each other to define a longitudinal gap indicated by arrow **34**. Further, each baffle array itself preferably comprises three rows of arcuate vanes spaced as described above so that no straight uninterrupted path for water is defined through the array. The gap **34** divides the baffle arrays into two regions, an outer region and an inner region and the gaps **30** in the barrier walls **20** align with the gap **34**. As shown in FIG. **8**, a mesh made of air permeable non-woven polymer vent material **36** is draped over the baffle arrays of the inner region and is welded, heat staked, or otherwise attached along the insides of these baffle arrays and on the outsides within the gap **34**. This forms a weather filter encasing the inner regions of the baffle arrays through which attic air can pass out but through which wind-blown rain and snowflakes cannot pass in.

The weather filter **36** is particularly effective for stopping wind-blown snow. Snowflakes behave differently than rainwater in that they can be blown around the arcuate vanes of the baffle arrays and make their way toward the hip slot. With the weather filter **36** in place, any snowflakes that make it through the baffle arrays of the outer region are entangled and trapped within the material of the weather filter and do not penetrate through the baffle arrays of the inner region. Eventually these snowflakes melt and drain away from the hip of the roof. In addition, some snowflakes are redirected away from the vent by the aerodynamic shape of the arcuate vanes in the outer region. This combination has proven to provide a robust and reliable barrier against infiltration of wind-blown snow into an attic space below. FIG. **9** also shows the gap **34** between the baffle arrays of the inner and outer regions where one edge of the weather filter is welded, heat staked, or otherwise attached.

FIG. **10** shows a hip roof **41** covered with shingles **40** and having a hip **42** sloping in the down-slope direction **25**. A hip slot **43** is cut in the roof and extends along the hip to provide a ventilation path for the attic space below. Lying on the roof **41** next to the hip **42** is a hip vent constructed according to the present invention. The vent is shown upside down in FIG. **10**. The weather filter **36** is shown draped over and welded in place covering the baffle arrays of the inner region. As mentioned, the weather filter **36** is welded or otherwise attached in the gaps **34** between the inner and outer regions of baffle arrays in such a way that the encase the inner baffle arrays. The weather filter also may be welded or otherwise attached to the underside of the flexible panel along the inner sides of the inner regions of baffle arrays. In this way, snow and/or rainwater must pass through two layers of the weather filter to reach the ridge slot **43** when the hip vent is installed. In fact, the weather filter may cover both the inner and outer baffle arrays if desired to provide an even more enhanced resistance to windblown rain and snow. Also seen in FIG. **10** are the two conformable filler strips **37** extending beneath each edge portion of the hip vent, where they are attached by welding, heat staking, or other appropriate attachment means.

The hip vent **15** shown in FIG. **10** is installed by being flipped over, positioned along the hip so that it straddles and overlies the hip slot **43**, and attached to the roof deck on either side of the hip slot with fasteners such as nails. When so installed, the filler strips **37** compress against the shingles **40** and, due to the spongy nature of the filler strips, conform to the surfaces of the shingles. While standard three tab asphalt shingles are shown in FIG. **10**, many roofs are shingled with much thicker and textured architectural shingles. In such installations, the filler strips can conform to radical differences in the heights of shingle surfaces thereby filling gaps that would be formed without the filler strips. It has been found that the filler strips eliminate the need for caulking to seal between the shingles and the edges of the hip vent.

FIG. **11** shows the results of rain penetration testing of the hip vent disclosed herein. A hip vent according to the above disclosure was installed along the hip of a mock hip roof as described above. Simulated windblown rain was then directed from a rain machine toward the hip covered by the hip vent. The tests were conducted with rain blown at the hip from zero degrees (i.e. along the hip), forty-five degrees to the hip, and ninety degrees to the hip. At each of these angles, tests were conducted at wind speeds of 35, 70, 90, and 110 miles per hour as per Miami WDR TAS-100(a)-95 protocol. Any water that seeped into the space below the roof was collected and its volume measured. Miami WDR TAS-100(A)-95 protocol allows a maximum of 1500 ml of water for the vent to pass the test. As shown on the right in FIG. **11**, only with 110 mph windblown rain did any water leak into the attic through the hip slot. Even then, the amounts were only 25 ml at zero degrees and 20 ml at 90 degrees. These amounts are considered in the industry to be negligible and fall well within the parameters for certification of attic ventilation products.

The invention has been described above within the context of preferred embodiments and methodologies considered by the inventors to represent the best modes of carrying out the invention. It will be understood by the skilled artisan, however, that a wide array of additions, deletions, and modifications, both subtle and gross, might be made to the example embodiments without departing from the scope of the invention itself. For instance, while the vent has been described as a hip vent for use along the hips of hip roofs, which is its intended use, there is no reason why it would not function perfectly well along the ridge of a gable or other type roof. The vanes of the baffle arrays in the preferred embodiment are circular arcs in shape. However, other shapes such as V-shaped, polygonal shaped, chevron shaped, spiral shaped, or other shapes might be used to obtain equivalent results. The disclosed hip vent may be used with or without the weather filter and with or without the filler strips depending upon application. For example, the weather filter may not be needed in areas of the country that do not experience snow storms or high velocity rain storms. The filler strips may not be needed when installing the hip vent on roofs with flat non-textured shingles (although filler strips are still considered by the inventors to be advisable). Further, the filler strips may be attached to the bottoms of hip vents either in the factory or in the field as needed. If installed in the field, they need only be attached with adhesive along the bottoms of the outer (and/or inner) wind baffle zones. As an alternative to the weather filter disclosed in the preferred embodiment, an air permeable insert may be formed and installed within and along the gap between the wind baffle zones. Such an insert may be made of recycled fibers, polymeric fibers, co-mingled fibers, natural fibers, mixtures of the forgoing, and layered or dual density material. Such inserts also may be formed with holes, passageways, or slots that allow air to flow but form barriers to windblown rain, snot, and insects. Finally, the hip vent of the

preferred embodiment is made of injection molded plastic. It will be understood, however, that other materials such as metal may be substituted without departing from the spirit and scope of the invention. These and other modifications are possible, and all are intended to fall within the scope of the present invention.

The invention claimed is:

**1**. A roof, comprising:

a hip or ridge having a slot formed therealong;

at least one vent configured to be installed along the slot and comprising:

a top panel including a central portion having an upper surface, a lower surface, and side edges;

a plurality of baffle arrays positioned along the lower surface of the top panel, each of the baffle arrays comprising a plurality of rows of spaced vanes;

wherein the baffle arrays comprise an outer region of baffle arrays positioned between the central portion of the top panel and each side edge of the top panel, and an inner region of baffle arrays positioned between the central portion of the top panel and each outer region of baffle arrays;

an outermost and lowermost vane of each baffle array has an arcuate portion that is oriented substantially transverse to an orientation of the vanes and a straight portion that extends from an inner end of the arcuate portion to connect integrally to a barrier wall of a plurality of barrier walls; and

wherein a plurality of second ends of at least some of the vanes located nearer an adjacent one of the side edges are arranged such that a transverse axis from the adjacent one of the side edges passing through each of the plurality of second ends also passes through first ends of adjacent vanes of an adjacent row of vanes such that water, snow, debris, or a combination thereof, encountering the vanes is redirected away from the slot formed along the ridge or hip of the roof and toward the side edges of the top panel.

**2**. The roof of claim **1**, wherein the inner regions of baffle arrays and the outer regions of baffle arrays are separated by a longitudinally extending gap.

**3**. The roof of claim **2**, further comprising an air permeable weather filter received within the longitudinally extending gap.

**4**. The roof of claim **1**, further comprising the plurality of barrier walls spaced along the lower surface of the top panel and extending between the side edges of the top panel and the central portion of the top panel; wherein one or more of the baffle arrays are separated by at least one barrier wall.

**5**. The roof of claim **1**, further comprising a filler strip positioned along at least some of the outer regions of baffle arrays adjacent each of the side edges of the top panel; wherein the filler strip is configured to conform to surfaces of adjacent shingles when the vent is installed on the roof.

**6**. The roof of claim **5**, wherein the filler strip comprises a plurality of polymer strands or a foam material.

**7**. The roof of claim **1**, wherein at least some of the vanes of at least one of the baffle arrays comprise independent structures not connected to another structure depending from the lower surface of the top panel.

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