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(54) **ENVIRONMENTALLY FRIENDLY AIR CONDITIONING VENTILATION FILTER**

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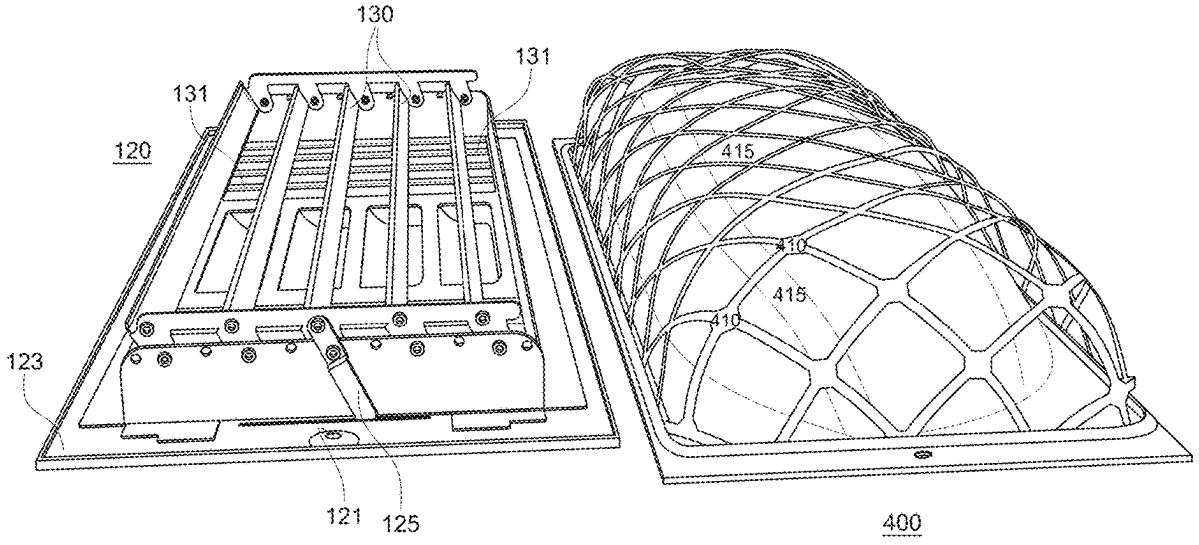
(57) **ABSTRACT**

Disclosed herein is a heating, ventilation and air conditioning (HVAC) filter including a rectangular back frame having an opening in a middle of the rectangular back frame, wherein the rectangular back frame is made of a recyclable cardboard material; a continuous filtering material, the continuous filtering material having narrow depth around edges of the sheet and a larger depth in a middle of the continuous filtering material, wherein the continuous filtering material is made of a recyclable material; and a backing pattern adhered to edges of the rectangular back frame, the backing pattern to hold the continuous filtering material, wherein the backing pattern is made of a recyclable material.



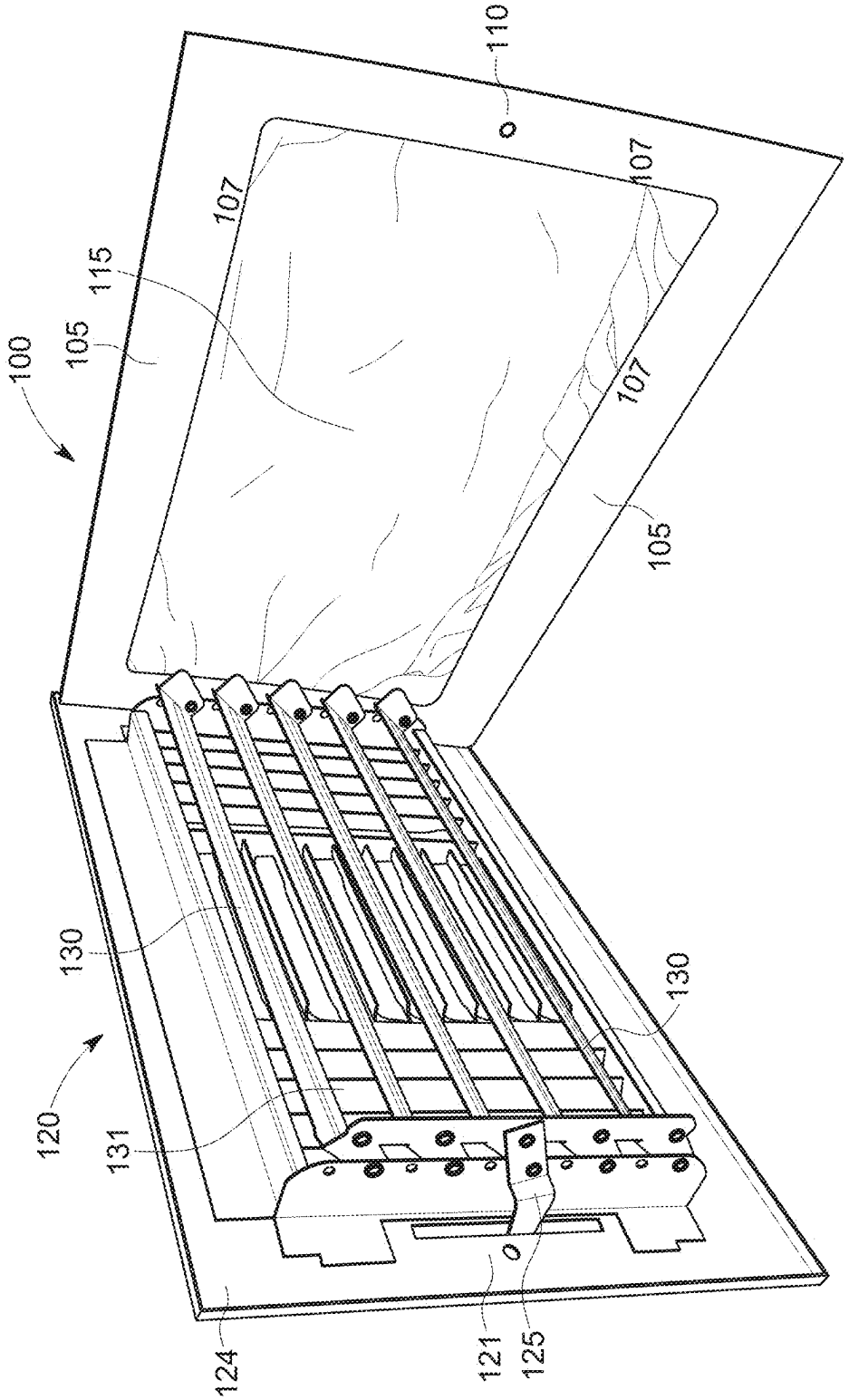


FIG. 1

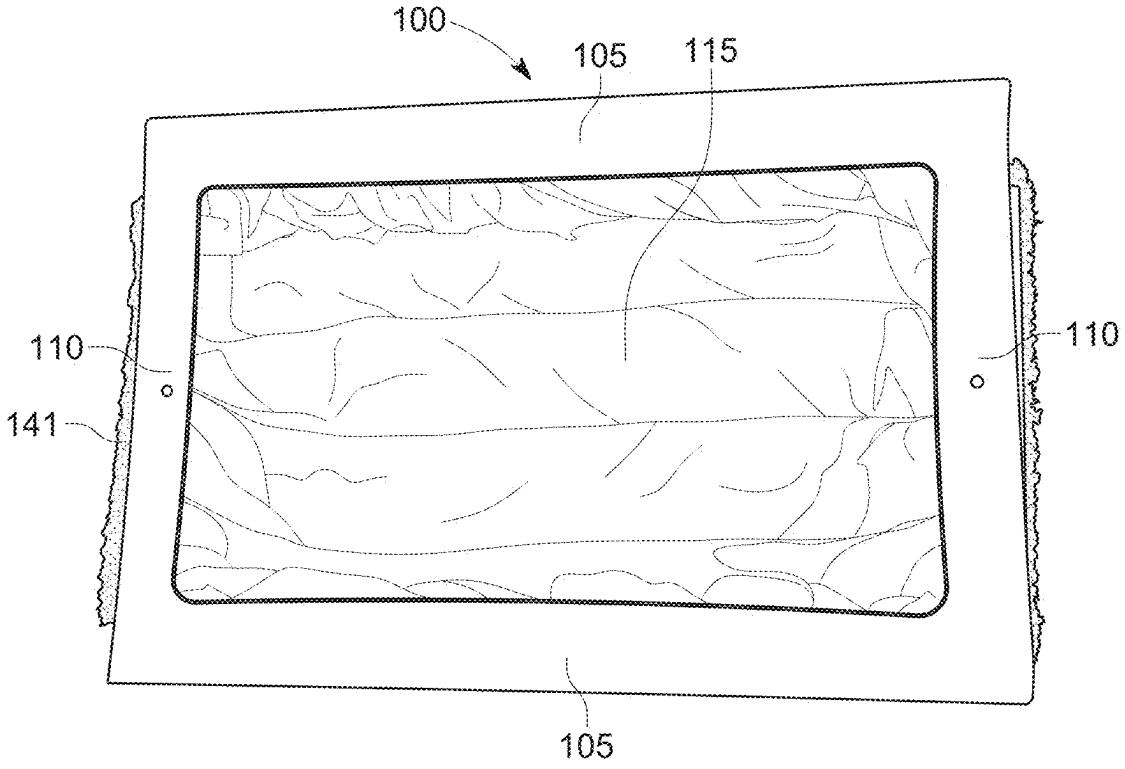


FIG. 2

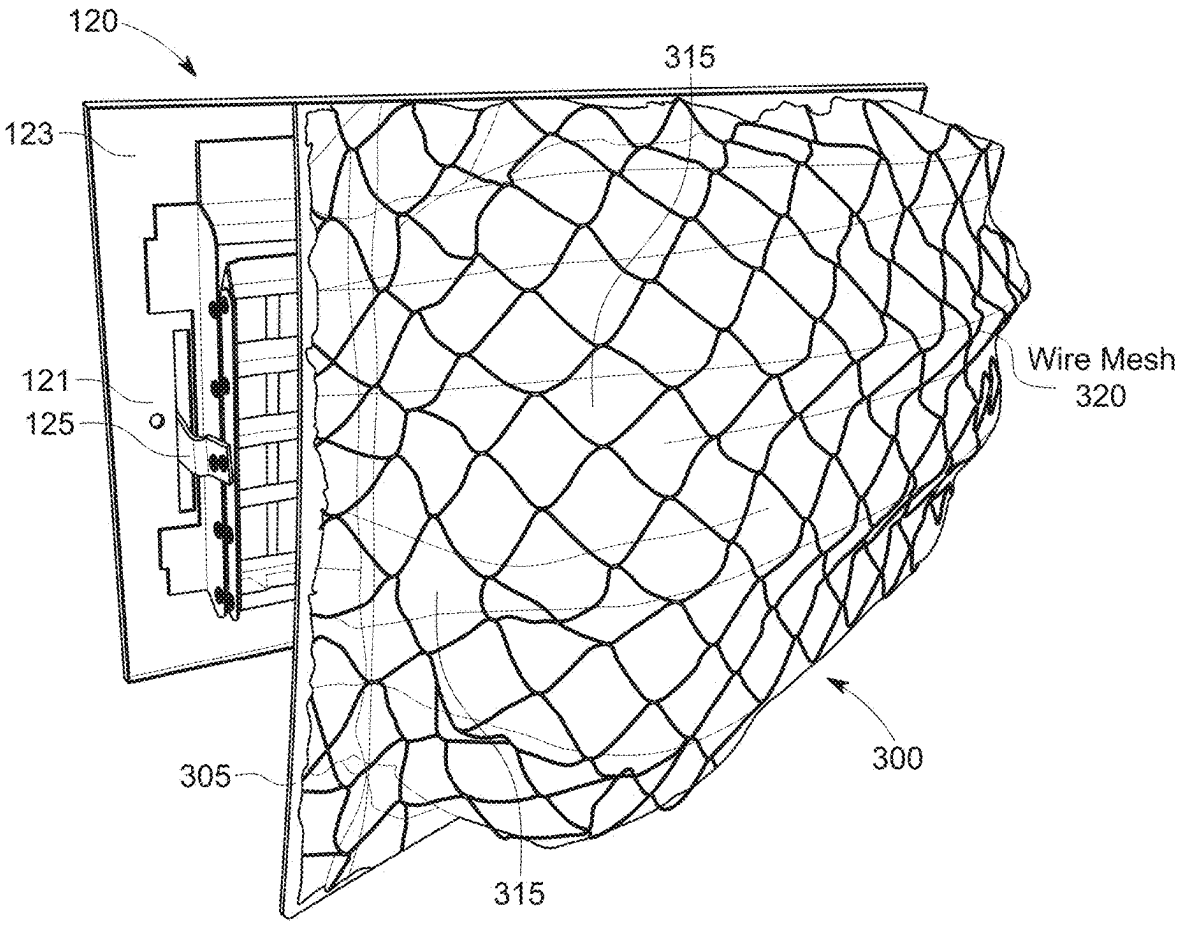


FIG. 3

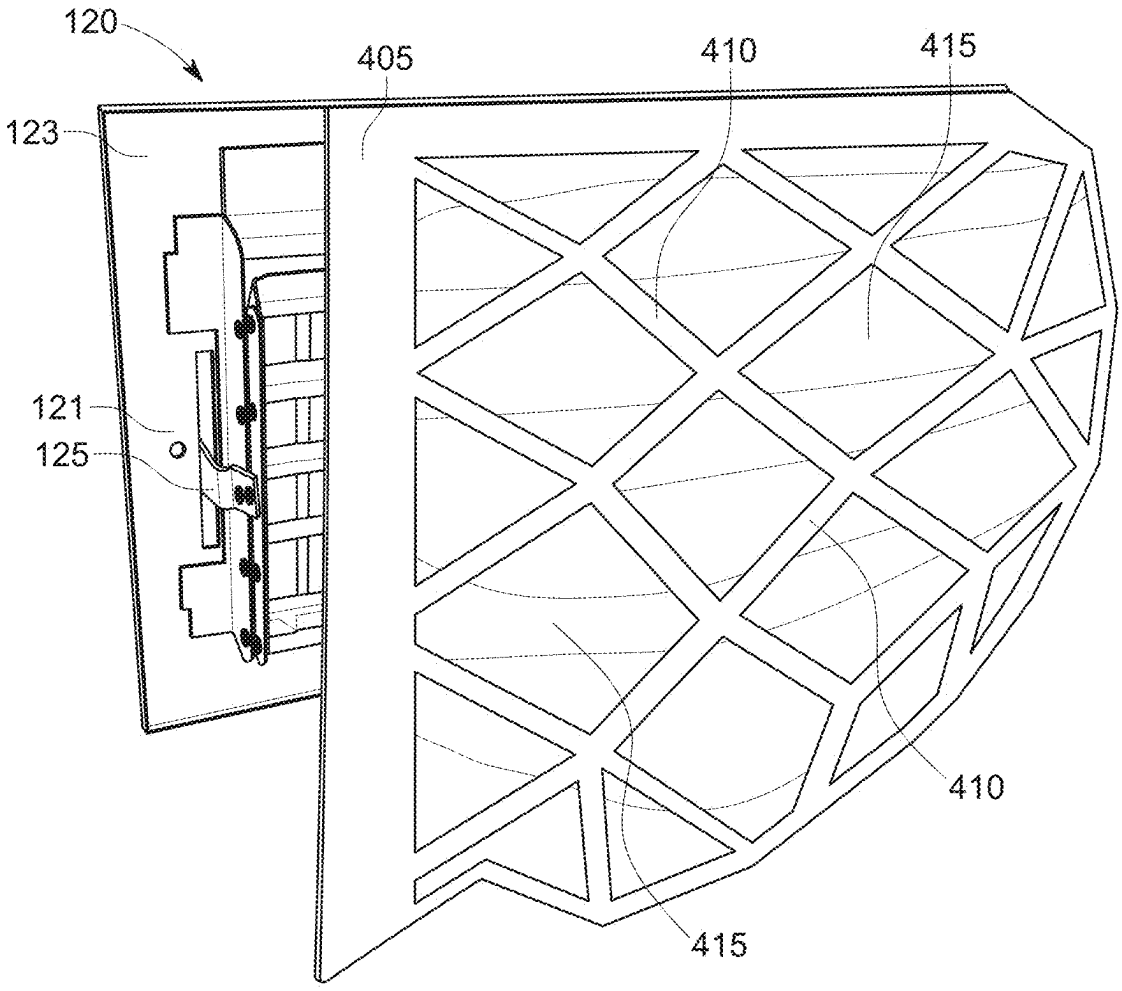


FIG. 4A

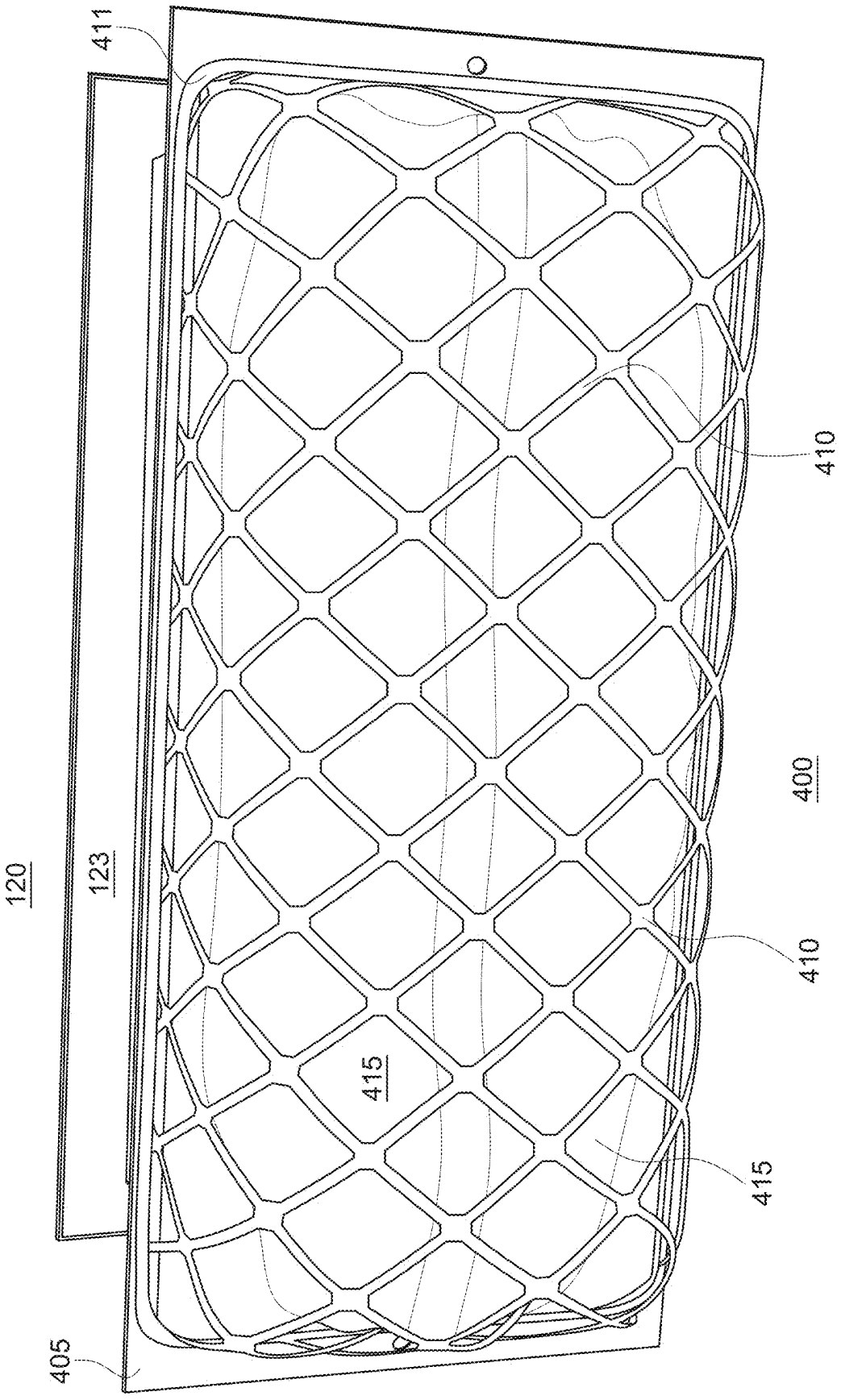


FIG. 4B

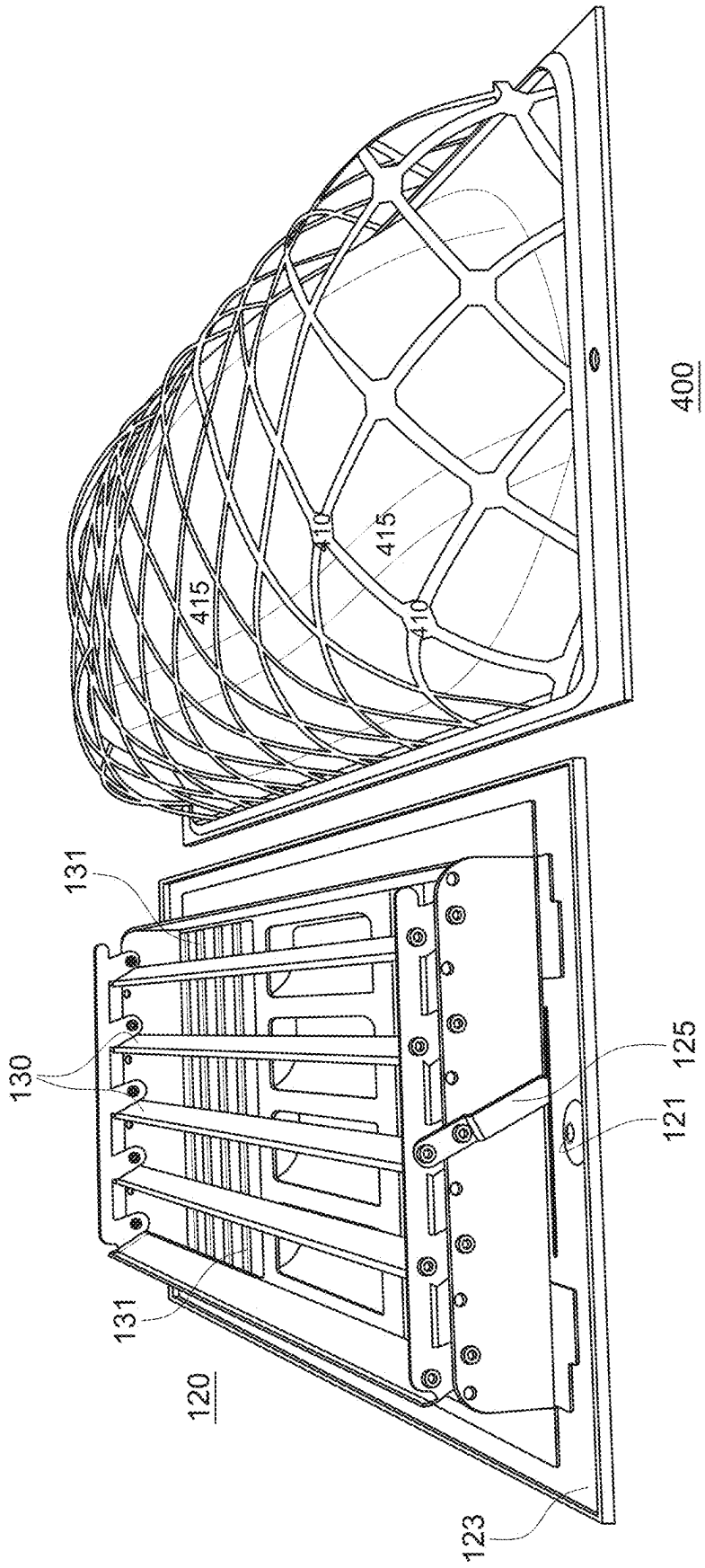


FIG. 4C

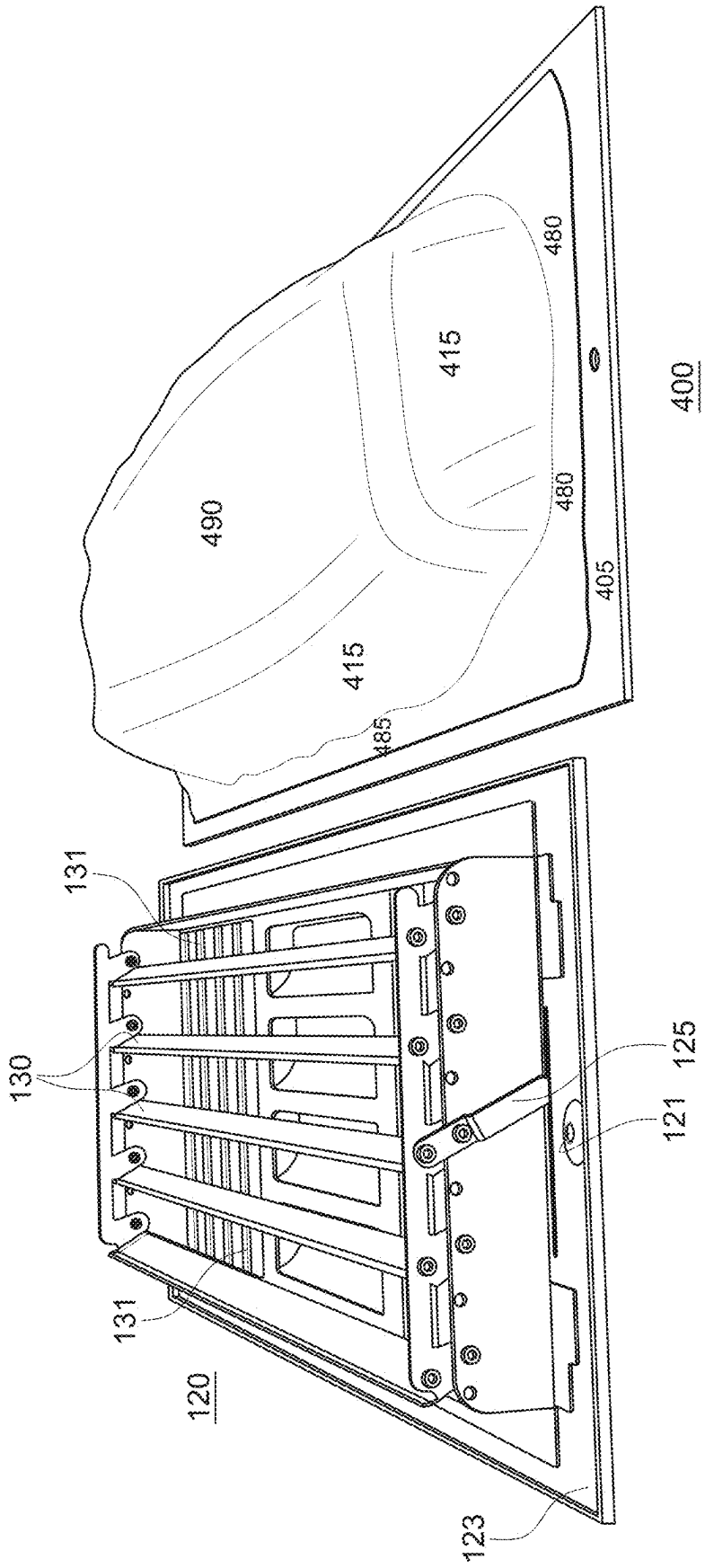


FIG. 4D

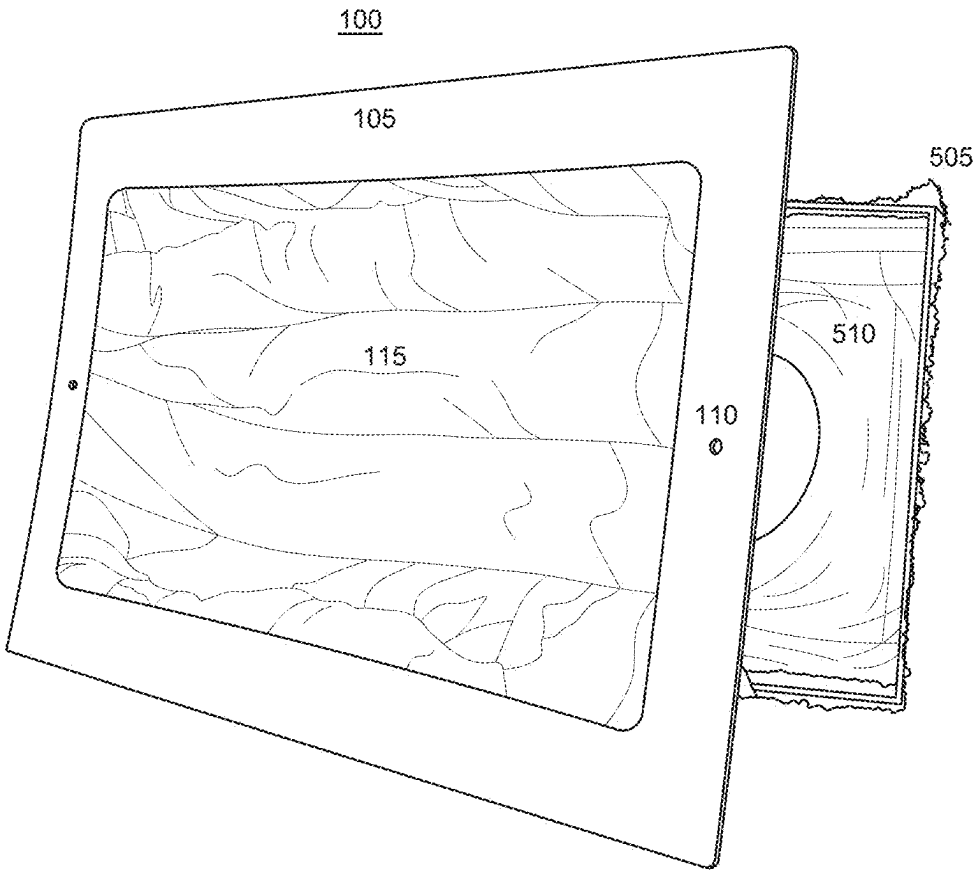


FIG. 5

FIG. 6

ENVIRONMENTALLY FRIENDLY AIR CONDITIONING VENTILATION FILTER

RELATED APPLICATION

[0001] This application claims priority to U.S. provisional patent application Ser. No. 63/555,244, filed Feb. 19, 2024, entitled "Environmentally Friendly Air Conditioning Ventilation Filter," the entirety of which is hereby incorporated by reference.

BACKGROUND

[0002] Filters exist in HVAC systems for cleaning the air before the air enters into the air conditioning units. These filters are used to protect particles and dust from the air conditioning units and causing problems with the equipment's mechanical or electrical components. However, dirty air may still be received into a grill or return and make its way into air conditioning ducts especially if a room or an environment is dirty. In addition, if the air conditioning ducts are dirty then registers (which deliver the air into a room) will output dirty air into a room. Accordingly, a solution to output clean air from registers and input clean air through grills or returns for an HVAC system is needed for buildings and houses. This is especially true due to a large number of people having respiratory problems and/or asthma issues.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] A better understanding of the features, advantages and principles of the present disclosure will be obtained by reference to the following detailed description that sets forth illustrative embodiments, and the accompanying drawings of which:

[0004] FIG. **1** illustrates a back view of a HVAC register and a front view of a ventilation filter according to exemplary embodiments;

[0005] FIG. **2** illustrates a front view of a HVAC ventilation filter according to exemplary embodiments;

[0006] FIG. **3** illustrates a back view of an HVAC ventilation filter with wire backing according to exemplary embodiments;

[0007] FIG. **4**A illustrates a back view of an HVAC ventilation filter with backing, in accordance with some embodiments;

[0008] FIG. **4**B illustrates a back view of an HVAC ventilation filter with backing, in accordance with some embodiments;

[0009] FIG. **4**C illustrates a side view of a HVAC register and a HVAC ventilation filter with backing in accordance with some embodiments;

[0010] FIG. **4**D illustrates a side view of a HVAC register and a HVAC ventilation filter with no backing in accordance with some embodiments;

[0011] FIG. **5** illustrates how an HVAC ventilation filter with backing is installed into an HVAC vent, in accordance with some embodiments; and

[0012] FIG. **6** illustrates locations of a register and a grill or return in accordance with some embodiments.

DETAILED DESCRIPTION

[0013] The following detailed description and provides a better understanding of the features and advantages of the inventions described in the present disclosure in accordance with the embodiments disclosed herein. Although the detailed description includes many specific embodiments, these are provided by way of example only and should not be construed as limiting the scope of the inventions disclosed herein.

[0014] Described herein is an environmentally friendly (or green) heating, ventilation and air conditioning ("HVAC") ventilation filter for vents or grills and registers in a house or building according to exemplary embodiments. In exemplary embodiments, the entire HVAC ventilation filter may be of 100 percent recyclable materials. In other cases, everything except the filtering material may be made of 100 percent recyclable materials. In other embodiments, the entire HVAC ventilation filter and the filtering material may be made of 100 percent recyclable material but the backing material may be made of wire. Unlike other filters, the filtering material may have a three-dimensional shape in that it has more depth and has a curved shape or a raised shape in existing HVAC filters which have a specified uniform thickness (e.g., ½ inch, ¾ inches or one inch) and are flat. In some embodiments, the filtering material may be more of a boxed or rectangular shape. This allows for additional filtering material to be utilized and provide better cleaning and removing of particulates as the air enters and/or exits the HVAC system. In addition, this allows these new and novel HVAC filters to be utilized with HVAC registers which have a depth to movable vents and flanges and other associated hardware. In addition, the HVAC filters described herein are utilized close to users and occupants of houses, rather than next to the HVAC equipment. This provides an extra protection against contaminants and/or dirt or dust that may be dispersed into the rooms or spaces because the contaminants or other material are prevented from entering a room or space or the contaminants, dirt, and/or dust are significantly reduced by the new and novel air filter.

[0015] FIG. **1** illustrates a back view of a HVAC register and a front view of a ventilation filter according to exemplary embodiments. In FIG. **1**, a register **120** is illustrated along with a new and improved HVAC ventilation filter **100**. In FIG. **1**, the register **120** may normally connected to a wall, a floor or structure through two or more holes **121**. The screws or other fasteners may be connected to the wall, floor or structure. The screws or fasteners may be on opposite sides of the register **120** to provide a secure connection. In some implementations, the register **120** may include a plate **124** with a plurality of vertical **131** or horizontal vents **131** along with the previously mentioned holes **121**. Because a register is delivering air from the HVAC system to a room, the register also will include a damper **125** that is attached or coupled a plurality of adjustable horizontal louvers **130** where the damper **125** may be moved to open the louvers **130** in order to allow air to be output to the room or to close the louvers **130** in order to prevent or minimize air being output to the room. In some embodiments, the louvers and dampers add a depth or width to the register **120**. In some implementations, the depth or width may be between 0.5 inches to four inches.

[0016] In exemplary embodiments, the improved air ventilation filter **100** may include a light cardboard or stiff paper frame **105**, at least two holes or openings **110**, filtering material **115** and a backing (not shown in FIG. **1**). In exemplary embodiments, the at least two holes or opening **110** need to correspond and be in same position as the two or more holes **121** in the HVAC register plate **124**. This

allows the HVAC air ventilation filter **100** to be held in place and not move when air is passing through and have its efficiency compromised. In exemplary embodiments, the light cardboard or stiff paper frame **105** may be recyclable. In exemplary embodiments, the light cardboard or stiff paper frame **105** may be 2 millimeters thick or may range from 0.5 to 4 millimeters thick. The light cardboard or stiff paper frame **105** may include four sides (e.g., left side, right side, top side and bottom side) with an opening in the middle where the filtering material **115** is located. In exemplary embodiments, the opening may have edges **107** around a circumference of the opening. In exemplary embodiments, the filtering material **115** may a) be connected to cardboard or paper frame **105** by fasteners, b) be sewn to the cardboard or paper frame, or 3) may be adhered to the cardboard or paper frame **105**. In exemplary embodiments, the filtering material **115** may be connected, sewn or adhered to an inner circumference of the top, bottom, left and right sides of the cardboard or paper frame **105**. In exemplary embodiments, the filtering material **115** may be connected, sewn or adhered continuously to edges of the opening of the cardboard or paper frame **105** in order to not allow holes or air gaps between the filtering material **115** and the cardboard or paper frame. In exemplary embodiments, the filtering material **115** may be made of a paper material, a fiberglass material, a cotton material, or a non-woven synthetic material (or in some cases may be made of a combination of two or more of these materials). In exemplary embodiments, the filtering material **115** may be flexible in order to create any shape and may not be rigid. In exemplary embodiments, the dimensions of the cardboard or paper frame **105** may be slightly smaller than the HVAC register **120** or HVAC grill in order to fit within the dimensions of the HVAC register **120** or grill and not be seen from outside the HVAC register and grill **120** (e.g., to someone in a room or space having the HVAC register and grill **120**). In exemplary embodiments, a width of side portions (left and right side portions) of the paper frame from an outside edge of the paper frame to the opening of the frame may be 1.0 inches or 0.5 inches. In other embodiments, the width of the left and right side portions from an outside edge of the paper frame to the opening in the frame may range from 0.25 inches to 6 inches. In exemplary embodiments, a width of top and bottom portions of the frame **105** from an outside edge to the opening of the frame **105** may range from 0.1 inches to 1.0 inches. In exemplary embodiments, the width of the side portions may be uniform on all sides (left, right, top and bottom). In exemplary embodiments, the width of the sides may be uniform on opposite sides (e.g., top and bottom or left and right) but the top and bottom have a different width than left and right. In exemplary embodiments, the width of the side portions may be greater than the width of the top and bottom portions of the paper frame. In exemplary embodiments, the frame (paper or cardboard or other material) may be a rigid material. In exemplary embodiments, the frame **105** may have a thickness of 0.2 millimeters. In exemplary embodiments, the frame **105** may have a thickness ranging from 0.1 millimeters to 1.0 millimeters.

[0017] FIG. **2** illustrates a front view of a HVAC ventilation filter according to exemplary embodiments. In exemplary embodiments, the HVAC ventilation filter **100** may include a paper backing **105**, two or more holes or openings **110**, and filtering material **115**. Reference number **141** illustrates that the filtering material **115** may be three dimensional and have a depth or thickness. In exemplary embodiments, this allows the filtering material to accommodate vents and/or louvers of a register **120**.

[0018] Due to the depth or width of the register **120**, in exemplary embodiments the HVAC air ventilation filter **100** cannot be flat or a uniform depth or thickness for the whole filter, as most current HVAC filters are. In exemplary embodiments, the ventilation filter **100** may have a curved back surface to allow for the varying of the thickness of the ventilation filter. In exemplary embodiments, the ventilation filter **100** may have more a boxed shaped or slope shaped back surface (e.g., formed by a backing and/or a filtering material). Thus, in exemplary embodiments, the depth or width or of the HVAC air filter **100** may range from 1 inch to 6 inches in order to not come in contact with the horizontal louvers **130** of the register **120** or to minimize contact with the vents **131** and louvers **130** of the register **120** and not get torn or damaged. For grills or returns, the depth or width of the HVAC air filter **100** may not be as important because there is no damper **125** and no plurality of horizontal louvers **130** utilized in the grill or return and thus the width or thickness of the grill or return is uniform. However, even with respect to grills and returns, the HVAC air ventilation filter **100** described herein may not have uniform thickness (the ventilation filter may have varying depth or thickness) because this is a novel feature of the presently described subject matter. This is a significant difference from the air filters existing in the market today which have uniform thickness. In exemplary embodiments, this allows more filtering material to be utilized in the filter and thus, this new and novel HVAC filter may be more efficient in removing particles and contaminants from the air.

[0019] FIG. **3** illustrates a back view of a ventilation filter with wire backing according to exemplary embodiments. In the embodiment illustrated in FIG. **3**, a wire mesh or wire backing **320** may form a barrier or net to keep a shape of the filtering material **315** and/or to keep the filtering material from moving too far back into an HVAC vent. In other words, a back or backing of the HVAC air ventilation filter **300** may be an open wire mesh. In exemplary embodiments, the wire mesh or wire **320** may connected, adhered or sewn to a back of the cardboard frame or paper frame **305**. In exemplary embodiments, the wire mesh or wire baking **320** may allow a flexible shape on a rear side of the HVAC air ventilation filter. In exemplary embodiments, the wire mesh or wire backing **320** may be made of a flexible material. In exemplary embodiments, the filtering material **315** may be made of a paper material, a fiberglass material, a cotton material, or a non-woven synthetic material. In some embodiments, the wire mesh or wire may be the only part of the HVAC ventilation filter **300** that is not recyclable

[0020] FIG. **4**A illustrates a back view of a HVAC ventilation filter with a paper or thin cardboard back frame pattern according to exemplary embodiments. FIG. **4**B illustrates a back view of a HVAC ventilation filter with a thin cardboard back frame pattern according to exemplary embodiments. FIG. **4**C illustrates a side view of a HVAC register and a new and novel HVAC filter according to exemplary embodiments. FIGS. **4**A,**4**C and **4**D illustrate an entirely recyclable HVAC air ventilation filter **400** according to exemplary embodiments along with FIG. **1** and FIG. **2**. In accordance with some embodiments, the paper or thin cardboard back frame pattern or backing pattern **410** may form a structure to hold in the filter material **415**. In exemplary embodiments,

the frame pattern **410** may need to be flexible in order to accommodate a non-uniform thickness for the HVAC filter **400** or any movement of the filtering material **415**. In exemplary embodiments, the paper or thin cardboard back frame pattern or backing pattern **410** may be connected, adhered or sewn to the frame **405** of the HVAC ventilation filter **400** on an outside of where the filtering material **415** is connected, coupled, adhered or sewn to the frame **405** of the HVAC ventilation filter. In exemplary embodiments, the filtering material **415** may be made of paper or may be made of cotton and thus be recyclable. In exemplary embodiments, the paper or thin cardboard back frame pattern **410** may form an x crossing pattern across the back of the HVAC air ventilation filter. These embodiments of the HVAC filter may be green in that all of the materials may be recyclable. In exemplary embodiments, a width of the paper backing pattern **410** may be 0.25 inches or may range from 0.2 inches to 3 inches. In exemplary embodiments, the backing pattern **410** may be uniform across a back or rear side of the filtering material **415**. In exemplary embodiments, a thickness of the lines or x pattern may range from 0.1 to 0.75 inches in order to provide uniform support to the filtering material.

[0021] FIG. **4**D illustrates a HVAC ventilation filter without a backing pattern or backing structure according to exemplary embodiments. In exemplary embodiments, the HVAC ventilation filter **400** may not have a backing pattern. In other words, in exemplary embodiments, the HVAC ventilation filter **400** may include only a frame **405** and filtering material **415**. In these embodiments, the filtering material **415** may need to be press formed or press stamped in order to create a shape to accommodate the register and louvers and/or also to maintain its boxed or curved shape. In these embodiments, the filtering material **415** may have either a curved or boxed shape. In these embodiments, the filtering material **415** may need to be made of a slightly more rigid material as compared to the embodiments illustrated in FIGS. **4**B and **4**C so that the filtering material in FIG. **4**D may not lose shape as wind or air moves through it because it has no backing pattern.

[0022] In exemplary embodiments, the filtering material **415** may have edge portions that have a different depth than central or middle portions of the filtering material. This is illustrated in FIG. **4**D wherein left and right portions **480** and top and bottom edge portions **485** of the filtering material **415** have a different depth than middle or center portions **490** of the filtering material. In exemplary embodiments, a depth of the filtering material **415** for the edge portions **480** and **485** may be 6 millimeters. In other embodiments, a depth of the filtering material **415** for the edge portions **480** and **485** may range from 2 millimeters to 30 millimeters. In exemplary embodiments, a depth of the filtering material **415** for the middle or central portions **490** may be 2 inches. In other embodiments, a depth of the filtering material **415** for the middle or central portions **490** may range from 1 inch to 4 inches. In exemplary embodiments, the filtering material **415** may rise at approximately a 90 degree angle when transitioning from edge portions **480** and **485** to middle or central portions **490**. In other embodiments, the filtering material **415** may rise at a range between 45 to 90 degrees with respect to a flat surface when transitioning from edge portions **480** and **485** to middle or central portions **490**.

[0023] The subject matter described above would not be limited to one size or register, vent, grill or return. The subject matter described in FIGS. **1**, **2**, **3**, **4**A, **4**B, **4**C and **4**D would be adaptable to all varieties and sizes of HVAC registers, vents, grills or returns. Specific sizes for HVAC registers, vents, grills or returns that the subject matter described herein could be adapted to include 6 inches×6 inches, 8 inches×4 inches, 8 inches×6 inches, 8 inches×8 inches, 10 inches×4 inches, 10 inches×6 inches, 10 inches×10 inches, 12 inches×4 inches, 12 inches×6 inches, 12 inches×12 inches and/or 14 inches by 4 inches. As noted previously, the HVAC air ventilation filters described herein may have dimensions that are less than these dimensions (of the registers, grills or returns) by an amount of less than 0.1 inches. In other embodiments, the HVAC air ventilation filters described herein may have dimensions that are less than the dimensions of the registers, grills or returns by an amount ranging from 0.25 inches to 3 inches.

[0024] FIG. **5** illustrates how an HVAC ventilation filter with backing is installed into an HVAC vent, in accordance with some embodiments. In FIG. **5**, the HVAC ventilation filter **100** may be placed or inserted into a wall opening **505** that includes an HVAC duct work **510**. The HVAC air ventilation filter may be placed into the opening and may be connected or attached to the wall via the openings **110** on both sides of the HVAC filter **100**. In many cases, the wall may not have an opening into which the connectors may be screwed into and in other cases, there is an anchor in the wall.

[0025] FIG. **6** illustrates locations of a register and a grill or return in accordance with some embodiments. In FIG. **6**, a register **510** (which has an improved HVAC air ventilation filter) may be installed in a wall **507** and may distribute air or heat into a room or space. In exemplary embodiments, the room may also include a grill or return **520** installed into another wall **505**. Air may return into the HVAC system through the grill or return **520**.

[0026] The air ventilation filter described herein was tested for a week on registers and grills and the resulting dirt and particles that were captured were visibly apparent (there was a black residue on the HVAC air ventilation filter). This stresses the need for such an improved HVAC air ventilation filter for registers, vents or grills.

[0027] A person of ordinary skill in the art will recognize that any process or method disclosed herein can be modified in many ways. The process parameters and sequence of the steps described and/or illustrated herein are given by way of example only and can be varied as desired. For example, while the steps illustrated and/or described herein may be shown or discussed in a particular order, these steps do not necessarily need to be performed in the order illustrated or discussed.

[0028] The various exemplary methods described and/or illustrated herein may also omit one or more of the steps described or illustrated herein or comprise additional steps in addition to those disclosed. Further, a step of any method as disclosed herein can be combined with any one or more steps of any other method as disclosed herein.

[0029] Unless otherwise noted, the terms "connected to" and "coupled to" (and their derivatives), as used in the specification and claims, are to be construed as permitting both direct and indirect (i.e., via other elements or components) connection. In addition, the terms "a" or "an," as used in the specification and claims, are to be construed as meaning "at least one of" Finally, for ease of use, the terms "including" and "having" (and their derivatives), as used in

the specification and claims, are interchangeable with and shall have the same meaning as the word "comprising.

[0030] The processor as disclosed herein can be configured with instructions to perform any one or more steps of any method as disclosed herein.

[0031] As used herein, the term "or" is used inclusively to refer items in the alternative and in combination.

[0032] As used herein, characters such as numerals refer to like elements.

[0033] Embodiments of the present disclosure have been shown and described as set forth herein and are provided by way of example only. One of ordinary skill in the art will recognize numerous adaptations, changes, variations and substitutions without departing from the scope of the present disclosure. Several alternatives and combinations of the embodiments disclosed herein may be utilized without departing from the scope of the present disclosure and the inventions disclosed herein. Therefore, the scope of the presently disclosed inventions shall be defined solely by the scope of the appended claims and the equivalents thereof.

1. A heating, ventilation and air conditioning (HVAC) filter, comprising:

a rectangular back frame having an opening in a middle of the rectangular back frame, wherein the rectangular back frame is made of a recyclable cardboard material;

a continuous filtering material, the continuous filtering material having narrow depth around edges of the sheet and a larger depth in a middle of the continuous filtering material, wherein the continuous filtering material is made of a recyclable material; and

a backing pattern adhered to edges of the rectangular back frame, the backing pattern to hold the continuous filtering material, wherein the backing pattern is made of a recyclable material.

2. The HVAC filter of claim **1**, wherein the continuous filtering material has a large enough depth to accommodate a HVAC register's horizontal and vertical vents or louvers.

3. The HVAC filter of claim **1**, wherein the continuous filtering material includes paper material.

4. The HVAC filter of claim **1**, wherein the continuous filtering material is synthetic cotton material that is recyclable.

5. The HVAC filter of claim **1**, wherein a width of the backing pattern is greater than 0.25 inches.

6. The HVAC filter of claim **1**, wherein a depth of the continuous filtering material at a center of the continuous filtering material is greater than 0.25 inches.

7. The HVAC filter of claim **1**, wherein the backing pattern is made of a Cardboard material that is recyclable

8. The HVAC filter of claim **1**, wherein the backing pattern includes a crossing pattern so that a plurality of openings are formed.

9. The HVAC filter of claim **1**, wherein the continuous filtering material is made of a fiberglass material, a cotton material or a non-woven synthetic material.

10. A heating, ventilation and air conditioning (HVAC) filter, comprising:

a rectangular back frame having an opening in a middle of the rectangular back frame, wherein the rectangular back frame is made of a recyclable cardboard material; and

a continuous filtering material, the continuous filtering material having narrow depth around edges of the sheet and a larger depth in a middle of the continuous filtering material, wherein the continuous filtering material is made of a recyclable synthetic material, wherein the depth of the continuous filtering material changes from the narrow depth along edge portions of the continuous filtering material to a larger depth in a middle or center portion of the continuous filtering material which corresponds to the opening of the rectangular back frame.

* * * * *