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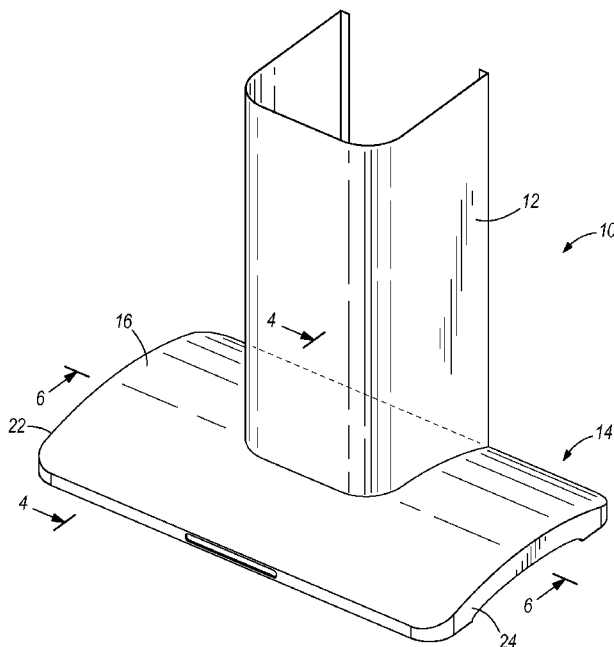


FIG. 1

(57) Abstract: A method of illuminating a range with at least one LED includes positioning a task light above a range, the task light including at least one LED, thermally coupling a heat sink to the at least one LED to cool the LED and measuring a temperature of the at least one LED. The method further includes moving air across the heat sink to cool the LED when the measured temperature exceeds a critical temperature, and illuminating the range with the at least one LED.

RANGE HOOD LIGHTING ARRANGEMENT

SUMMARY

[0001] The present invention relates to range hoods having at least one light for illuminating at least a portion of the range top. Lights positioned to illuminate ranges are subject to high temperatures during operation of the range. Such high temperatures can compromise the longevity and/or efficiency of the range hood lights. Incandescent and halogen lights are not very sensitive to high ambient temperature. Other lights, such as LEDs, are generally more sensitive to high ambient temperature. As such, LEDs have not yet been useable for providing an acceptable intensity or level of task lighting for a range hood application, because the LED run life, color, intensity, and/or efficiency is greatly compromised at such high temperatures.

[0002] In some embodiments, the invention provides a range hood positioned over a range. The range hood includes a housing having a lower surface positioned above the range, the lower surface defines an opening, a first lens positioned in the opening, and a second lens spaced from the first lens to define a gap between the first and second lenses. An LED module is adjacent to the second lens and spaced from the first lens, the LED module is positioned to illuminate a portion of the range, and a heat sink is thermally connected to the LED module to cool the LED module.

[0003] In some embodiments, the invention provides a range hood positioned over a range. The range hood includes a housing having a lower surface positioned above the range, the lower surface defining an opening, a lens positioned in the opening, and a light module connected to the lens. The light module includes at least one LED. A heat sink is thermally connected to the light module and spaced from the lens, and a seal is positioned between the heat sink and the light module to inhibit fluid flow between the lens and the heat sink to the light module.

[0004] In some embodiments the invention provides a method of illuminating a range top with at least one LED that includes positioning a task light above a range top, the task light includes at least one LED, and thermally coupling a heat sink to the at least one LED module to transfer heat away from the LED module. The method further includes measuring a temperature of the at least one LED module, moving air across the heat sink to cool the LED module when

the measured temperature exceeds a critical temperature, and illuminating the range top with the at least one LED module.

[0005] Other aspects of the invention will become apparent by consideration of the detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Fig. 1 is a top perspective view of a range hood according to some embodiments of the present invention.

[0007] Fig. 2 is perspective view of the range hood of Fig. 1 with a portion of the housing removed.

[0008] Fig. 3 is a bottom perspective view of the range hood of Fig. 1.

[0009] Fig. 4 is a cross-sectional view of the range hood, taken along line 4-4 of Fig. 1.

[0010] Fig. 5 is a perspective view of Fig. 4.

[0011] Fig. 6 is a cross-sectional view of the range hood, taken along line 6-6 of Fig. 1.

[0012] Fig. 6A is a cross-sectional view of an alternate range hood.

[0013] Fig. 7 is an enlarged view of Fig. 6 illustrating a lighting unit from a first angle.

[0014] Fig. 8 is an enlarged view of Fig. 6 illustrating the lighting unit from a second angle.

[0015] Fig. 9 is an enlarged view of Fig. 6 illustrating the lighting unit from a third angle.

[0016] Fig. 10 is an exploded view of the lighting unit.

[0017] Fig. 11 is a second exploded view of the lighting unit.

DETAILED DESCRIPTION

[0018] Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the

arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways.

[0019] Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. The use of “including,” “comprising,” or “having” and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items.

[0020] Unless specified or limited otherwise, the terms “mounted,” “connected,” “supported,” and “coupled” and variations thereof are used broadly and encompass both direct and indirect mountings, connections, supports, and couplings. Further, “connected” and “coupled” are not restricted to physical or mechanical connections or couplings. Also, it is to be understood that terms such as “first” and “second” are used herein for purposes of description and are not intended to indicate or imply relative importance or significance.

[0021] Figs. 1-4 illustrate a range hood 10 according to some embodiments of the invention. The range hood 10 is positionable over a range to provide light to a range top and items supported on the range top, and to ventilate air (or cooking effluent) from the cooking area above the range top. The range hood 10 can include a flue 12 and a housing 14. The flue 12 can be coupled to the housing 14 in any suitable manner. In some embodiments, the flue 12 can include one front panel and two side panels. In other embodiments, the housing 14 can have other constructions and configurations, some of which may include non-planar surfaces. The flue 12 can be coupled to a wall and/or a ceiling, and can also be connected to ducting, and/or recirculation components. Additional ducting or recirculation components can be positioned within an interior portion of the flue 12. The flue 12 can be at least partially constructed of a decorative material, such as stainless steel, painted metal, copper, etc.

[0022] The illustrated housing 14 includes a cover 16, a first or base panel 18, and a second or exterior panel 20. The illustrated base panel 18 and exterior panel 20 extend substantially horizontally, but in other embodiments, can extend diagonally, vertically, or any angle thereinbetween. Other quantities, locations and relative sizes of panels can be utilized and the base panel 18 and exterior panel 20 are shown by way of example only. The base panel 18 can

be coupled to and suspended from at least one of the cover 16 and the exterior panel 20. In the illustrated embodiment, the base panel 18 is suspended from the exterior panel 20 by substantially L-shaped brackets 21 (see Fig. 4).

[0023] The housing 14 can further include first and second side panels 22 and 24 that are secured to the exterior panel 20 and the cover 16, and substantially enclose an interior of the range hood 10. In the illustrated embodiment, the cover 16 is coupled to the flue 12 and is suspended from the flue 12.

[0024] The exterior panel 20 can include at least one aperture (which may at least partially be covered by louvers, filters, shutters, dampers, and the like) to permit air flow into the housing 14, through the exterior panel 20 and into the flue 12. The illustrated exterior panel 20 includes first sets of louvers 26, second sets of louvers 28, and third sets of louvers 30 (see Figs. 3-5). In some embodiments, only one of the sets of louvers 26, 28, 30 is included. Other locations, quantities, and shapes of louvers are possible.

[0025] In some embodiments, such as the embodiment illustrated in Fig. 6A, an alternate set of louvers 31 is formed on the cover 16. The louvers 31 allow ambient air from an area outside of the heated cooking plume to be drawn into the housing 14. The ambient air is often cooler air, as it has not been heated by the cooking appliance. The ambient air also would likely not be laden with grease and humidity.

[0026] The range hood 10 can include at least one light module 36. The illustrated embodiment includes two such light modules 36, but other quantities, locations, shapes, and configurations of light modules can be utilized with the present invention. A heat sink 38 can be thermally coupled to each of the light modules 36. The heat sinks 38 can function as heat pipes to move heat away from the light modules 36. In the illustrated embodiment, the heat sinks 38 are either directly or indirectly thermally connected to the respective light module 36 for transfer of heat from the light module 36 to the heat sink 38. In other embodiments, the range hood 10 can include other structure and configurations to move heat away from the light module 36 and to prevent overheating of the light module 36. For example, the heat sinks 38 can transfer heat to the housing 14, the cover 16, etc. or to other exterior structure, to transfer heat away from the light module 36.

[0027] As more clearly illustrated in Figs. 4-11, each light module 36 can include a first or lower lens 40 extending across at least a portion of an aperture 42 in the base panel 18. The illustrated lower lens 40 is substantially flush with the base panel 18 to create a substantially planar surface. The base panel 18 includes a first, vertically-oriented flange 44 extending around at least a portion of the perimeter of the aperture 42 and the lower lens 40 includes a second, corresponding flange 46 extending around at least a portion of the perimeter of the lower lens 40. The first and second flanges 44 and 46 are shaped to matingly engage to retain the lower lens 40 on the base panel 18. In the illustrated embodiment, the first and second flanges 44 and 46 are shaped to snap fit together to removably retain the lower lens 40 in the aperture 42. In other embodiments, any suitable fastener or fastening arrangement can be utilized to couple the lower lens 40 to the base panel 18, such as bolts, screws, pins, rivets, or inter-engaging halves or parts, to fixedly or removably couple the lower lens 40 to the base panel 18. The lower lens 40 can be removed from and replaced in the housing 14, due to the snap-fit engagement or by other suitable fasteners. Such removal and replacement assists in servicing the light module 36 and cleaning the lower lens 40, among other things. In some embodiments, one or more of the LEDs 62 can be removed and replaced and/or the LED module 60 can be removed and replaced.

[0028] Each light module 36 can further include a second lens 48 spaced from the first lens 40 to define a first air gap 52 between the first lens 40 and the second lens 48. In some embodiments, the first gap 52 is between about 0.16 centimeter and about 2.54 centimeters. In some embodiments, the first gap 52 is between about 0.32 centimeters and about 1.91 centimeters. In some embodiments, the first gap 52 is around about 0.64 centimeters. The second lens 48 can be coupled to the exterior panel 20 with at least one fastener (not shown). The second lens 48 defines a pair of apertures 54 sized to receive any suitable fastener to couple the second lens 48 to the exterior panel 20.

[0029] While references is made herein to an “air gap”, in some embodiments, the space between the first lens 40 and the second lens 48 can be vacuous. In other embodiments, the space between the first lens 40 and the second lens 48 can be filled with a gas, such as argon. The gap, whether filled with air, another gas, or vacuous, can limit heat transfer, alter light quality, and/or improve the life of the LEDs.

[0030] The range hood 10 can include one or more filters or grilles that occupy a substantial portion of a bottom surface of the range hood 10. Lights are located on the range hood around the filters or grilles. It can be desirable to focus light from a perimeter of the range hood bottom surface to a center or central region of a range. Each range hood can have different geometrical requirements, such as length and width of the range hood and height above the range, among other things. The second lens 48 can optionally include at least one light-deflecting portion, such as the illustrated Fresnel lens 56. The illustrated embodiment includes five Fresnel lenses 56, but other quantities and locations of Fresnel lenses 56 are possible and can be utilized with the present invention. Each Fresnel lens 56 includes a center point through which center axis 58 extends. In some embodiments, the second lens 48 is textured, tinted, shaded, “frosted”, translucent, or otherwise not entirely transparent, around the Fresnel lenses 56 to inhibit stray light from emitting from the second lens 48. In some embodiments, at least one of the first and second lenses 40, 48 can be coupled to the range hood 10 with at least one tilting, rotatable, and/or adjustable gimbal. The gimbal permits the at least one of the first and second lenses 40, 48 to tilt freely with respect to the range hood 10 and thus, to direct light onto the range top.

[0031] Each light module 36 can further include an LED module 60 including at least one LED 62 thereon. The at least one LED 62 is operable to illuminate at least a portion of the range as a task light, without requiring incandescent, fluorescent, halogen, or other non-LED light to illuminate the range. The illustrated LED module 60 includes five LEDs 62 thereon. In some embodiments, such as the illustrated embodiment, each LED 62 has a respective Fresnel lens 56 to direct, focus, or bend light emitted by the respective LED 62. In some embodiments, differing quantities of LEDs 62 and Fresnel lenses 56 can be included in the range hood 10.

[0032] Each LED 62 includes a center point through which center axis 64 extends. As shown in Fig. 9, the center axis 58 of each Fresnel lens 56 can be offset a distance D from the center axis 64 of each LED 62. In some embodiments, the offset D can be between about 0.01 millimeters and about 300 millimeters. In other embodiments, the offset D can be between about 0.1 millimeters and about 30 millimeters. In still other embodiments, the offset D can be between about 1 millimeter and about 3 millimeters. The offset D focuses the light from the LEDs 62 onto a specific location or locations on the range. Each Fresnel lens 56 can concentrate or direct the light of the respective LED 62 to have more light where needed or desired. The

Fresnel lens 56 is operable to bend light from the respective LED 62 toward the desired target and to project the light over a further distance. The offset D is determined based upon the specific requirements, such as geometric limitations, for a given range.

[0033] A gasket or seal 68 substantially isolates the second lens 48 and the respective LED module 60. The second lenses 48 are spaced from the respective LED module 60 to define a second air gap 70 between the second lenses 48 and the respective LED module 60. The LED modules 60 are substantially air-tightly coupled to the respective second lens 48. The second gap 70 can be evacuated or filled with another gas or combination of gasses to improve thermal insulation, light quality, etc. The LEDs 62 are substantially isolated from contact with cooking effluent, such as moisture and grease, between the LED modules 60 and the second lens 48 by the seal 68. If cooking effluent contacts the LEDs 62, such effluent can reduce the operating life of the LEDs 62. In some embodiments, the second gap 70 is filled with a fluid, such as thermally resilient gas. In other embodiments, the second gap 70 is substantially a vacuum. In such embodiments, the second lens 48 and the LED module 60 can be substantially air-tightly coupled, such as for example by sonic welding or other suitable adhesive. Alternatively, the seal 68 can be a labyrinth seal, or other seal with overlapping members to form a substantially air-tight seal between the second lens 48 and the LED module 60.

[0034] The LEDs 62 are shielded from heat from the range by the first lens 40, the first air gap 52, the second lens 48, and the second air gap 70. To provide further shielding, either or both of the first and second lenses 40 and 48 can be formed from a polymeric material, or other materials which are poor conductors of heat. In some embodiments, the first lens 40 comprises high temperature polycarbonate or glass, and the second lens 48 includes lower temperature polycarbonate.

[0035] A thermal contact or gap filler 72, which in the illustrated embodiment is provided by a quantity of material, such as thermal grease or foam, is positioned between the LED module 60 and the heat sink 38. The thermal contact 72 can thermally couple the LED module 60 to the heat sink 38. The thermal contact 72 can optionally mechanically couple the LED module 60 to the heat sink 38 in embodiments that omit fasteners. In some embodiments, the thermal contact 72 is coupled to the LED module and the second panel 20, which is coupled to the heat sink 38.

In other embodiments, the thermal contact 72 is coupled to the LED module adjacent an aperture in the second panel 20, such that the thermal contact 72 abuts against the heat sink 38.

[0036] Each heat sink 38 can be formed from aluminum or other highly thermally conductive material, such as magnesium, copper, ferrous materials, alloys, or combinations thereof. The illustrated heat sinks 38 include a plurality of fins 76, but can include various configurations to move heat away from the LED module 60. The illustrated heat sink 38 includes a first substantially planar portion 78 and second slotted or apertured portions 80, 82 (see Fig. 11). The first substantially planar portion 78 is positioned adjacent to the light module 36 to abut or nearly abut (via the second panel 20) the thermal contact 72. The first and second slotted portion 80, 82 are positioned on either side of the first substantially planar portion 78. The first and second slotted portion 80, 82 define first and second sets of slots 84, 86 extending therethrough. The first and second sets of slots 84, 86 can be positioned adjacent to louvers on the second panel 20 to permit flow of fluid therethrough. The illustrated heat sink 38 is of a one-piece construction with a number of substantially parallel and equally sized fins 76 defining a number of air channels therebetween. Other constructions are possible, such as two-piece or multi-piece constructions and/or heat sinks having different fin or air channel constructions without departing from the scope of the present invention.

[0037] In the illustrated embodiment, a thermistor 90 is electrically coupled to the LED module 60 to control current through the LEDs 62. The thermistor 90 has a variable resistance that is a function of temperature of the LEDs 62. The resistance of the thermistor 90 is at least partially dependent upon a temperature of the LED module 60. The temperature of the LED module 60 can be determined by the thermistor 90 or by a sensor 96. The sensed temperature is communicated to the controller 92 which can control current through the LEDs 62.

[0038] In some embodiments, a first thermistor 90 communicates with the controller 92 to control current through the LED module 60, which uses the predetermined LED operating parameters to adjust the current supplied to the LED module 60. A primary fan 94 draws fluid, such as cooking effluent, heat, steam and the like from the range top into the range hood 10 and moves the fluid through the flue 12. The primary fan 94 can also draw fluid over the heat sinks 38 to cool the light modules 36. In some embodiments, the user can actuate the primary fan 94

as desired. In other embodiments, the primary fan 94 operates whenever the range is in use. In some embodiments, a secondary fan 96 is included in the housing 14 to draw air across the heat sinks. In embodiments, such as the embodiment illustrated in Fig. 6A, one or more louvers 31 are provided in the range hood 10 to permit the secondary fan 96 to draw ambient air over the heat sinks 38. The ambient air is often cooler and cleaner than the cooking effluent and in some embodiments, is more desirable to cool the heat sinks 38 and light modules 36.

[0039] A second thermistor 95 (see Figs. 6, 6A) communicates with the controller 92 to control operation of the fan 94 (and optionally fan 96), which uses the predetermined LED operating parameters to actuate and/or adjust operating speed of the fan 94 (and optionally fan 96). The predetermined LED operating parameters are provided in a look up table, such that the controller 92 looks up the sensed parameter(s), such as temperature, current, voltage, and the like, and controls current through the LED module 60 and/or operation of one or more of the fans 94, 96, based upon the sensed parameter(s). The controller 92 can reduce the current through the LEDs 62 and/or actuate or increase the operation speed of the fan 94 when a temperature of the LED module 60 reaches a pre-set threshold value.

[0040] The controller 92 controls current through the LED module 60 independent of the operation of the fan 94. One or both of the thermistors 90, 95 can be replaced by a sensor that communicates with the controller 92 and/or the fan 94. Other sensors, such as mass flow sensors, can be utilized in place of or in addition to the thermistors 90, 95. The thermistors 90, 95 and/or other sensors can be positioned on the LED module 60, adjacent to any of the louvers 26, 28, 30, 31, on the heat sink 38 or any other suitable location in or on the range hood 10. In some embodiments, two sensors communicate with a controller, and the temperature differential between the two sensed temperatures is used to determine the temperature of the LEDs 62.

[0041] A number of air flow paths are defined between each of the first, second, and third sets of louvers 26, 28, 30, 31 and the flue 12. Each of the number of air flow paths extend across at least a portion of the heat sink 38 to cool the heat sink 38 by convection. The second panel 20 is thermally coupled to the heat sink 38 to cool the heat sink 38 by conduction. The air flow paths also extend across at least a portion of the second panel 20 to cool the second panel 20 by convection. When at least one of the fans 94, 96 are operating, fluid is directed along at least one

of the air flow paths to cool the heat sink 38 and therefore, cool the LED module 60. An alternative air flow path extends through an aperture 98 in the second panel 20 and across the heat sink 38 to cool the heat sink 38 by convection, see Fig. 7. Other louvers, apertures, or openings can be provided in the range hood housing 14 to permit air flow therethrough.

[0042] The heating shielding provided by the first lens 40, the first air gap 52, the second lens 48, and the second air gap 70 work together with the heat sink 38, the thermistor 90, and the fan 94 to provide a cooler operating environment for the LEDs 62. The cooler operating environment prolongs the operating life of the LEDs 62 for operation at higher currents (and thus higher light intensities) than have been previously possible in range hoods. Range hoods typically have to withstand environments of greater than 100,000 Btu/hr, and sometimes greater than 120,000 Btu/hr. The LEDs 62 of the present application can provide a light quality (color, intensity, chromaticity) comparable to existing lighting, for example, two 35-50 Watt halogen lights in a typical range hood. The light intensity is measured in Lux at the cook top surface with the range hood installed at a typical installation height. In some embodiments, the LEDs will operate for 10,000 hours at greater than 85% light output, and for 20,000 hours at greater than 70% light output. In some embodiments, the LEDs will have a run life of between about 40,000 and 50,000 hours. In some embodiments, the LEDs can have a run life of greater than 50,000 hours.

[0043] When the sensed temperature of the LED module approaches or reaches a critical module temperature (T_{cm}) and/or the sensed ambient temperature approaches or reaches a critical ambient temperature (T_{ca}), then one of two events occurs. The first event is actuation of the fan 94 to move air over the heat sink 38 to cool the LED module 38. The second event is decreasing the drive current of the LEDs 62 on the LED module 60, to decrease the light intensity and thereby lower the temperature of the LEDs 62. Because the temperature of the LEDs 62 is lowered, the temperature is kept below the critical module temperature (T_{cm}). Either or both of the first and second events can occur when either or both of the critical module temperature T_{cm} and the critical ambient temperature T_{ca} are reached. The LEDs will have a minimal color shift during operation, even when the critical module temperature T_{cm} and the critical ambient temperature T_{ca} are approached and the current is reduced. If there are several LED modules 36 on one range hood 10, they can be in electronic communication with one

another so that if one of the modules 36 reaches the critical temperature, all of the modules 36 will reduce current and dim at the same rate to maintain a substantially uniform light pattern at the cooking surface.

[0044] In some embodiments, the critical module temperature T_{cm} can be between about 75 degrees Celsius and about 150 degrees Celsius. In other embodiments, the critical module temperature T_{cm} can be between about 85 degrees Celsius and about 140 degrees Celsius. In still other embodiments, the critical module temperature T_{cm} can be between about 90 degrees Celsius and about 135 degrees Celsius. In one specific embodiment, the critical module temperature T_{cm} is around about 125 degrees Celsius.

[0045] In some embodiments, the critical ambient temperature T_{ca} can be between about 75 degrees Celsius and about 150 degrees Celsius. In other embodiments, the critical ambient temperature T_{ca} can be between about 85 degrees Celsius and about 140 degrees Celsius. In still other embodiments, the critical ambient temperature T_{ca} can be between about 90 degrees Celsius and about 135 degrees Celsius. In one specific embodiment, the critical ambient temperature T_{ca} is around about 100 degrees Celsius.

[0046] When the current through the LEDs 62 is reduced, the junction temperature of the LEDs 62 is reduced below the critical junction temperature, thus maintaining the longevity of the LEDs 62. The longevity of run life of the LEDs 62 can be increased, because the LEDs 62 operate at a lower current when the range hood temperature reaches a threshold value. In some embodiments, one or both of the events (reduction of current through the LEDs and/or actuation of or increase in speed of operation of the fan) occur prior to the critical module temperature T_{cm} and/or critical ambient temperature T_{ca} being reached. One or both of the events can inhibit the LED module 60 and/or the ambient temperature at the second panel 20 from reaching the respective one of the critical module temperature T_{cm} and the critical ambient temperature T_{ca} . The longevity of run life of the LEDs 62 can be increased, because the lower current through the LEDs 62 lowers the LED junction temperature. This maintains the temperature of the LEDs 62 below the critical junction temperature.

[0047] When the temperature has decreased sufficiently below the critical module temperature T_{cm} and/or the critical ambient temperature T_{ca} , the action can cease. Specifically,

the LEDs 62 can again be operated at normal current and the fan 94 can be turned off or returned to normal operating conditions. The controller 92 can have at least one of a look-up table, an equation, and a set point to determine the critical module temperature T_{cm} and the critical ambient temperature T_{ca} based upon the operating current of the LEDs 62. The controller 92 can control operation of the LEDs 62 and the fan 94 in response to the sensed critical module temperature T_{cm} and critical ambient temperature T_{ca} and the data in the look-up table, the equation, and the set point. The data in the at least one of the look-up table, the equation, and the set point are at least partially dependent upon the location of the sensor in the range hood 10, the distance of the light module 36 above the cook top, the heat rating of the LEDs 62, etc.

[0048] Various features and advantages of the invention are set forth in the following claims.

CLAIMS

What is claimed is:

1. A range hood positioned over a range, the range hood including:
 - a housing having a lower surface positioned above the range, the lower surface defining an opening;
 - a first lens positioned in the opening;
 - a second lens spaced from the first lens to define a gap between the first and second lenses;
 - an LED module adjacent the second lens and spaced from the first lens, the LED module positioned to illuminate a portion of the range; and
 - a heat sink thermally connected to the LED module to cool the LED module.
2. The range hood of claim 1, wherein the range hood defines a flow path along which vapor from elements supported on the range travels through the range hood, and wherein the heat sink is positioned along the flow path.
3. The range hood of claim 1, the housing further comprising an upper surface positioned above the lower surface, the upper surface defining a second opening, wherein the range hood defines a flow path along which ambient air travels through the second opening and across the heat sink.
4. The range hood of claim 1, further comprising a seal positioned between the second lens and the LED module to inhibit fluid flow across the LED module.
5. The range hood of claim 1, wherein one of the first lens and the second lens includes a Fresnel lens.
6. The range hood of claim 5, wherein the first lens is vertically spaced from the range, and wherein the Fresnel lens includes a center point that is horizontally offset from a center point of

the LED module to bend and direct light from the LED module onto a portion of the range that is horizontally spaced from the LED module.

7. The range hood of claim 1, further comprising a blower positioned in the housing to move air through the housing and across the heat sink.

8. The range hood of claim 1, wherein the LED module is a task light positioned to illuminate the range.

9. A range hood positioned over a range, the range hood including:
a housing having a lower surface positioned above the range, the lower surface defining an opening;
a lens positioned in the opening;
a light module connected to the lens, the light module including at least one LED;
a heat sink thermally connected to the light module and spaced from the lens; and
a seal positioned between the heat sink and the light module to inhibit fluid flow between the lens and the heat sink to the light module.

10. The range hood of claim 9, wherein the range hood defines a flow path along which air travels through the range hood between the opening and an exhaust outlet, and wherein the heat sink is positioned along the flow path.

11. The range hood of claim 9, the housing further comprising an upper surface positioned above the lower surface, the upper surface defining a second opening, wherein the range hood defines a flow path along which ambient air travels through the second opening and across the heat sink.

12. The range hood of claim 9, wherein the lens is a first lens, and further comprising a second lens positioned adjacent to the light module, the light module being positioned between the first lens and the second lens and being sealed to inhibit fluid flow across the light module.

13. The range hood of claim 12, wherein one of the first lens and the second lens is a Fresnel lens.
14. The range hood of claim 13, wherein the first lens is vertically spaced from the range, and wherein the Fresnel lens includes a center point that is horizontally offset from a center point of the light module to bend and direct light from the light module onto a portion of the range that is horizontally spaced from the light unit.
15. The range hood of claim 10, further comprising a blower positioned in the housing to move air through the housing and across the heat sink.
16. The range hood of claim 10, wherein the light module is a task light, such that the at least one LED of the light module illuminates the range.
17. A method of illuminating a range with at least one LED module, the method comprising:
 - positioning a task light above a range, the task light including at least one LED module;
 - thermally coupling a heat sink to the at least one LED module to transfer heat away from the LED module;
 - measuring a temperature of the at least one LED module;
 - moving air across the heat sink to cool the LED module when the measured temperature exceeds a critical temperature; and
 - illuminating the range with the at least one LED module.
18. The method of claim 17, further comprising directing light onto the range with at least one lens.
19. The method of claim 17, further comprising inhibiting flow of air across the at least one LED.
20. The method of claim 17, further comprising positioning the task light between a first lens and a second lens and sealing the at least one LED between the first lens and the second lens.

21. The method of claim 17, further comprising decreasing at least one of voltage and the current to the LED when the measured temperature exceeds the critical temperature for a set time.

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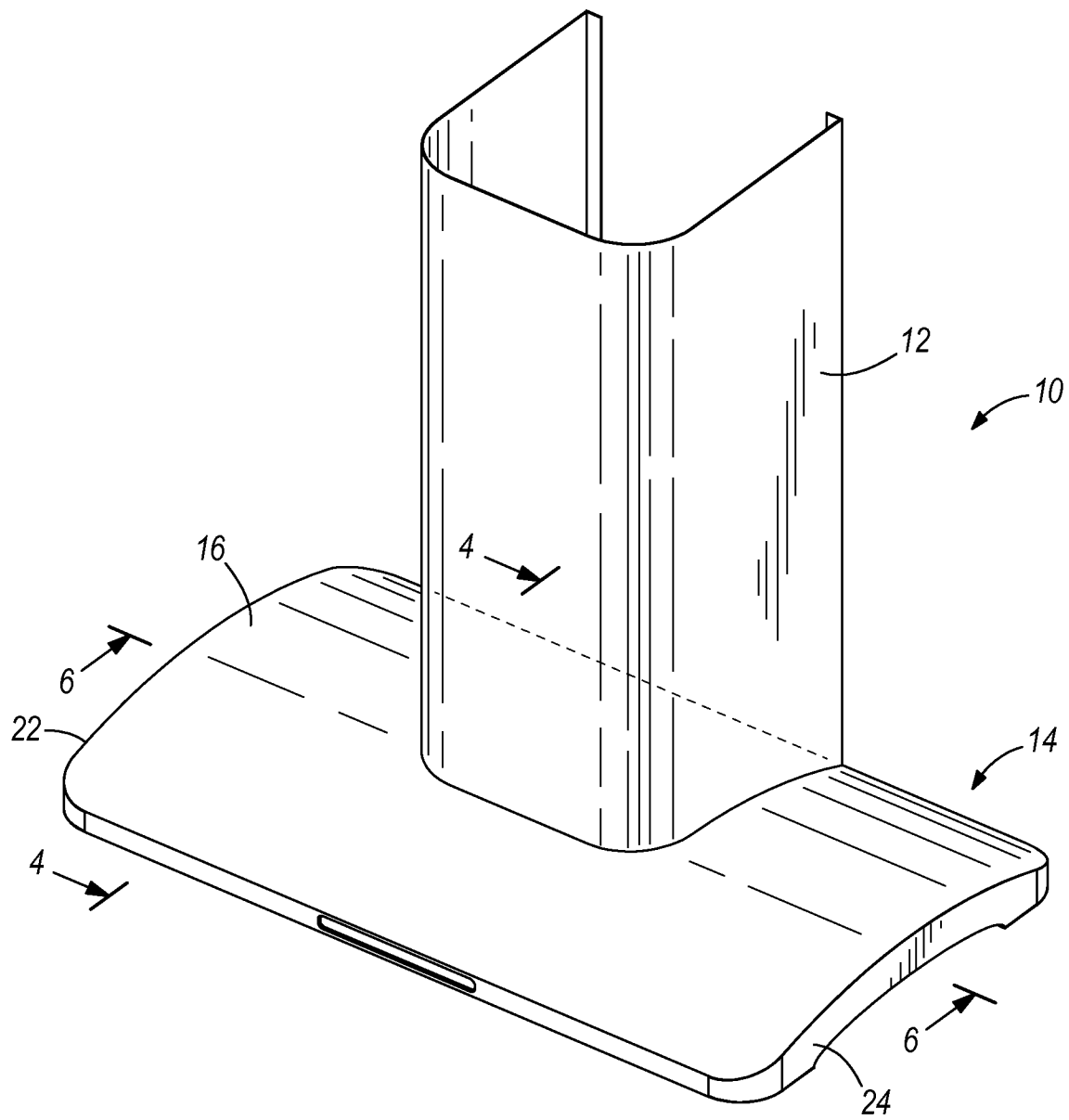


FIG. 1

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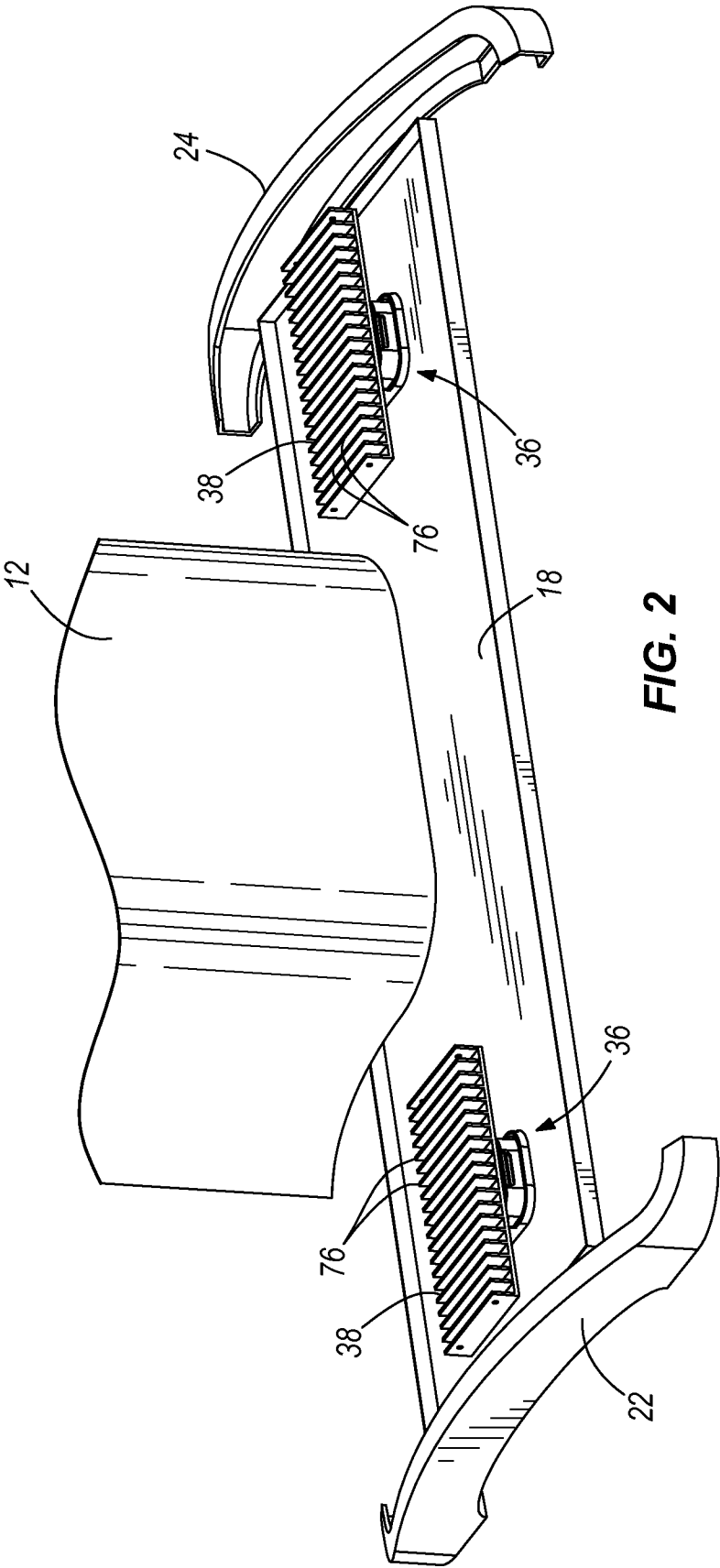


FIG. 2

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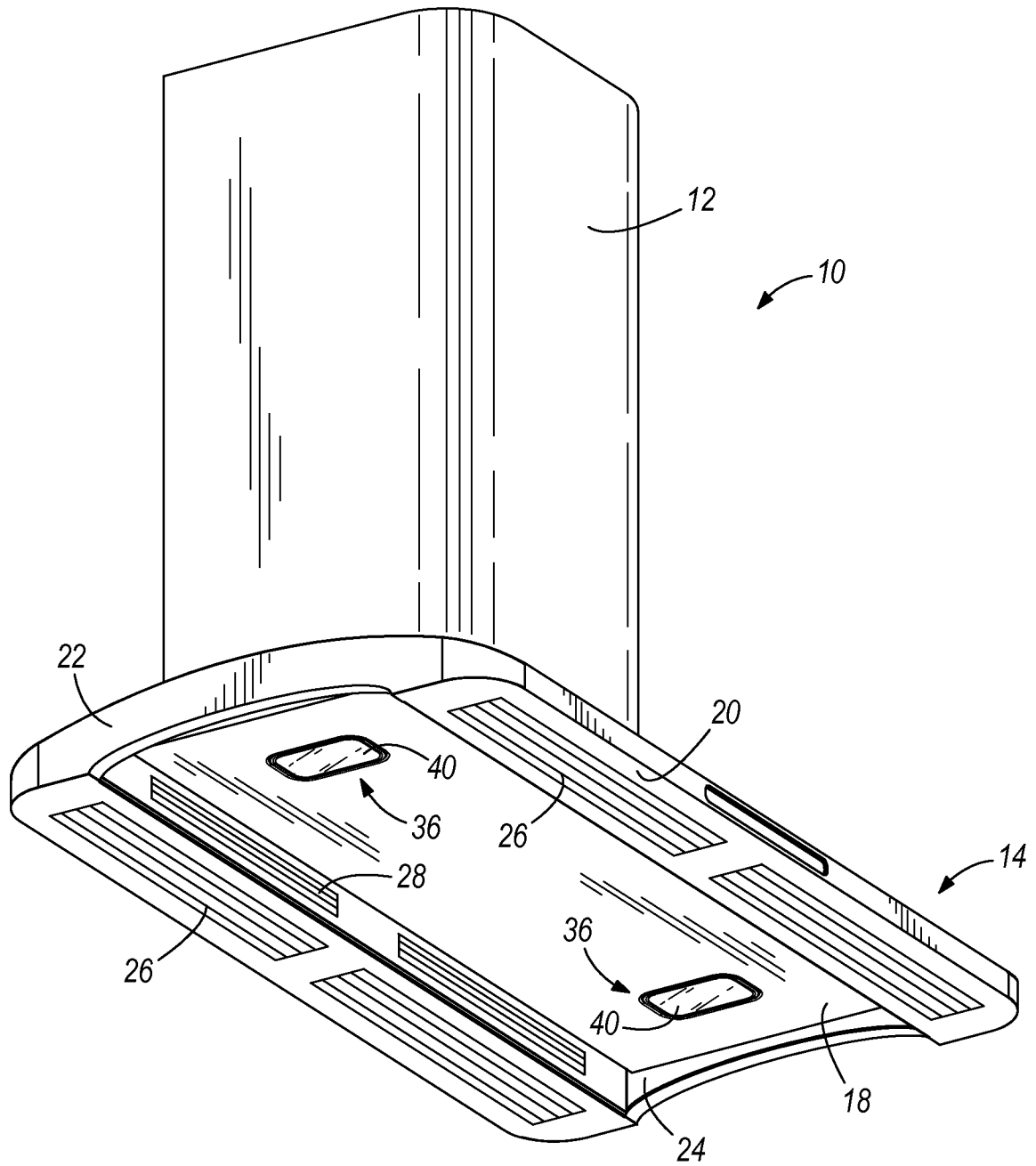
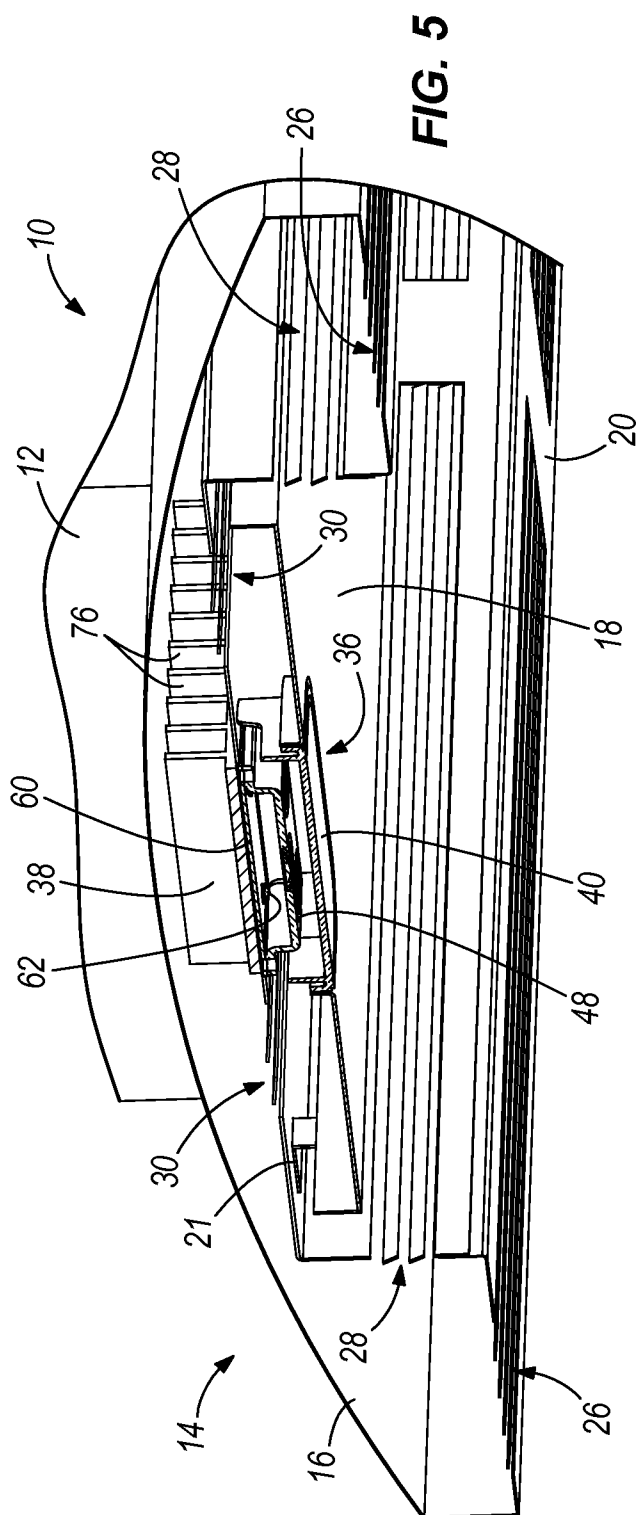
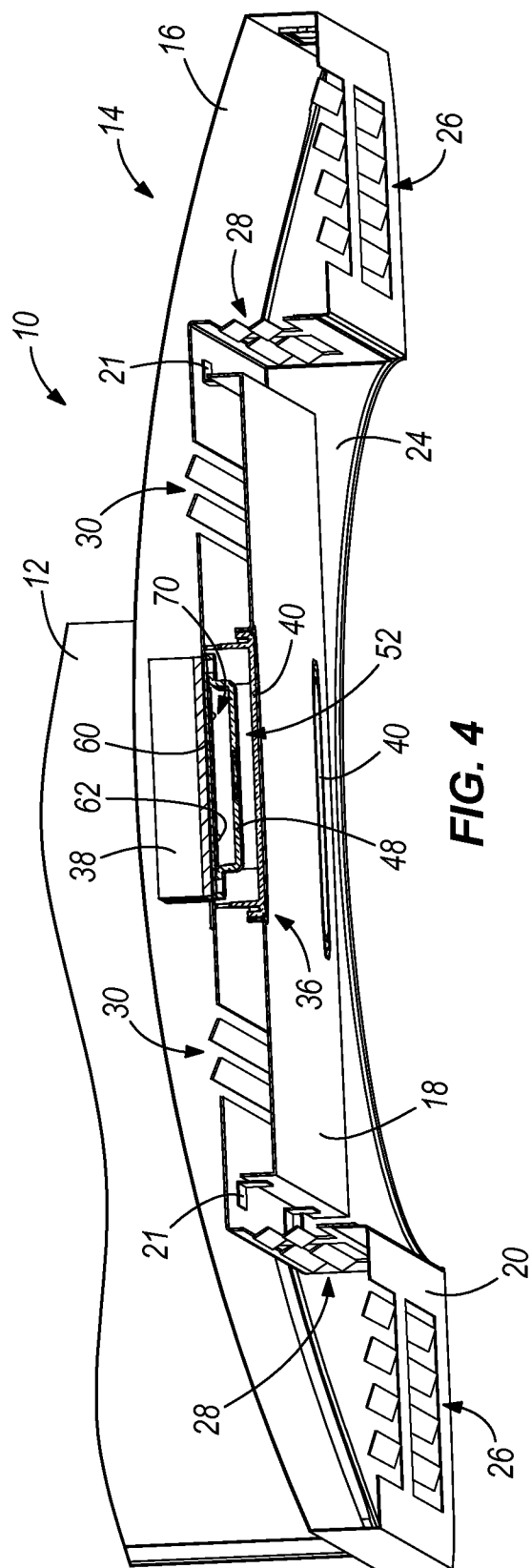


FIG. 3



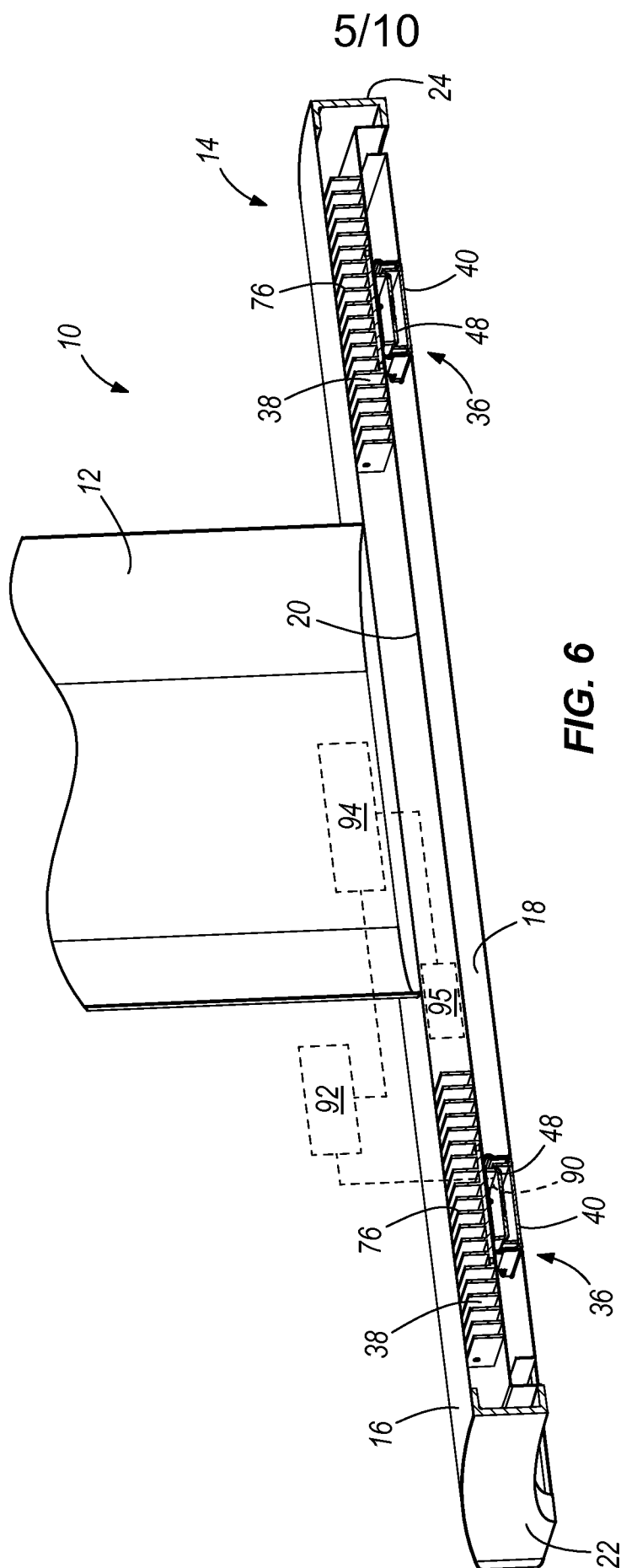


FIG. 6

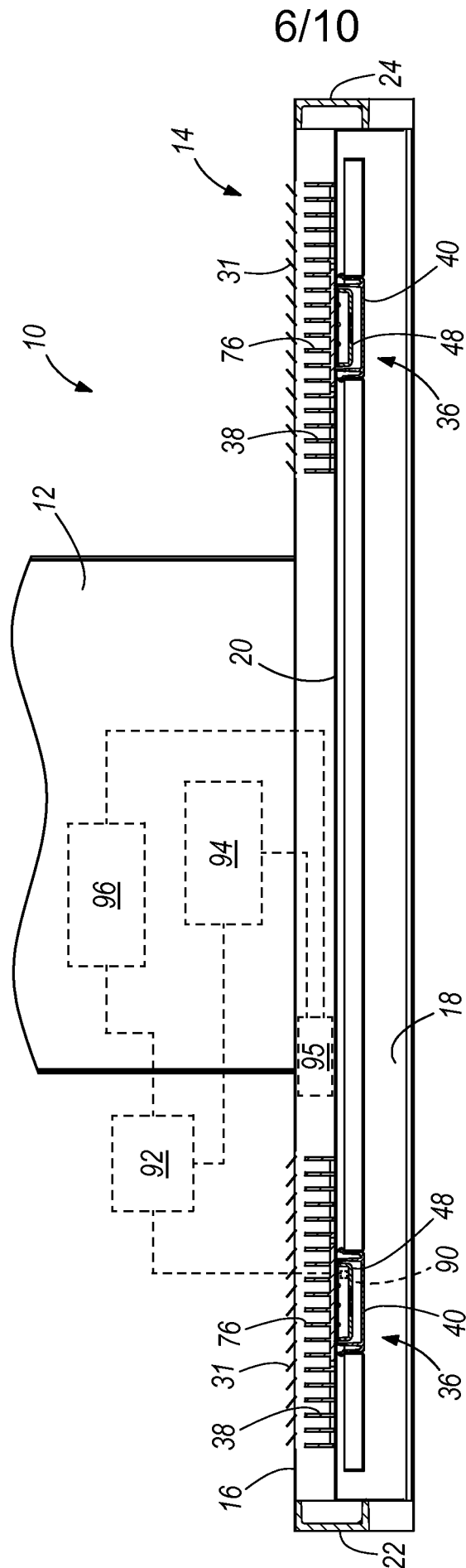


FIG. 6A

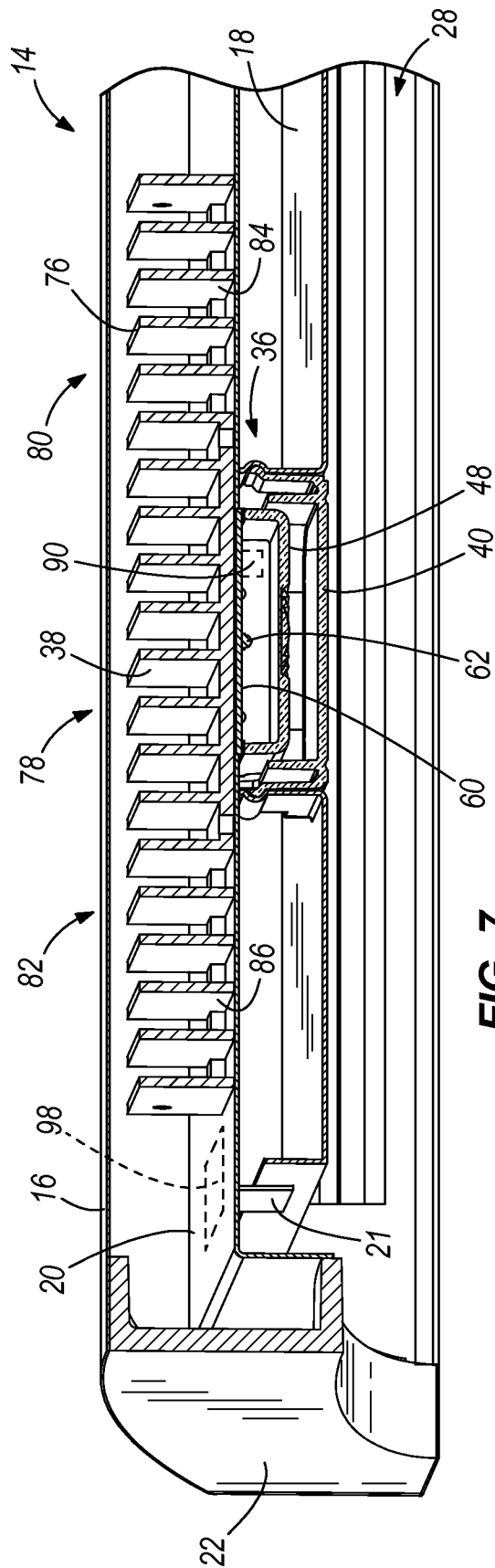


FIG. 7

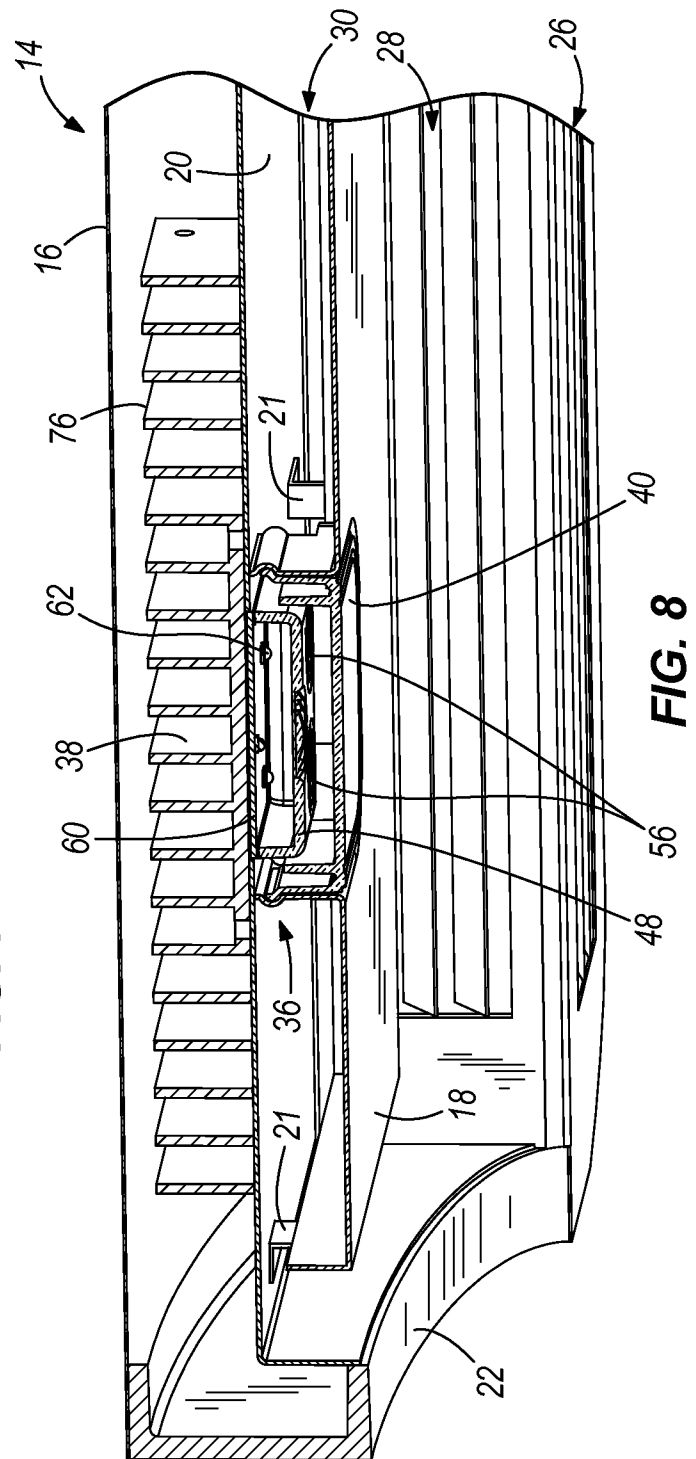
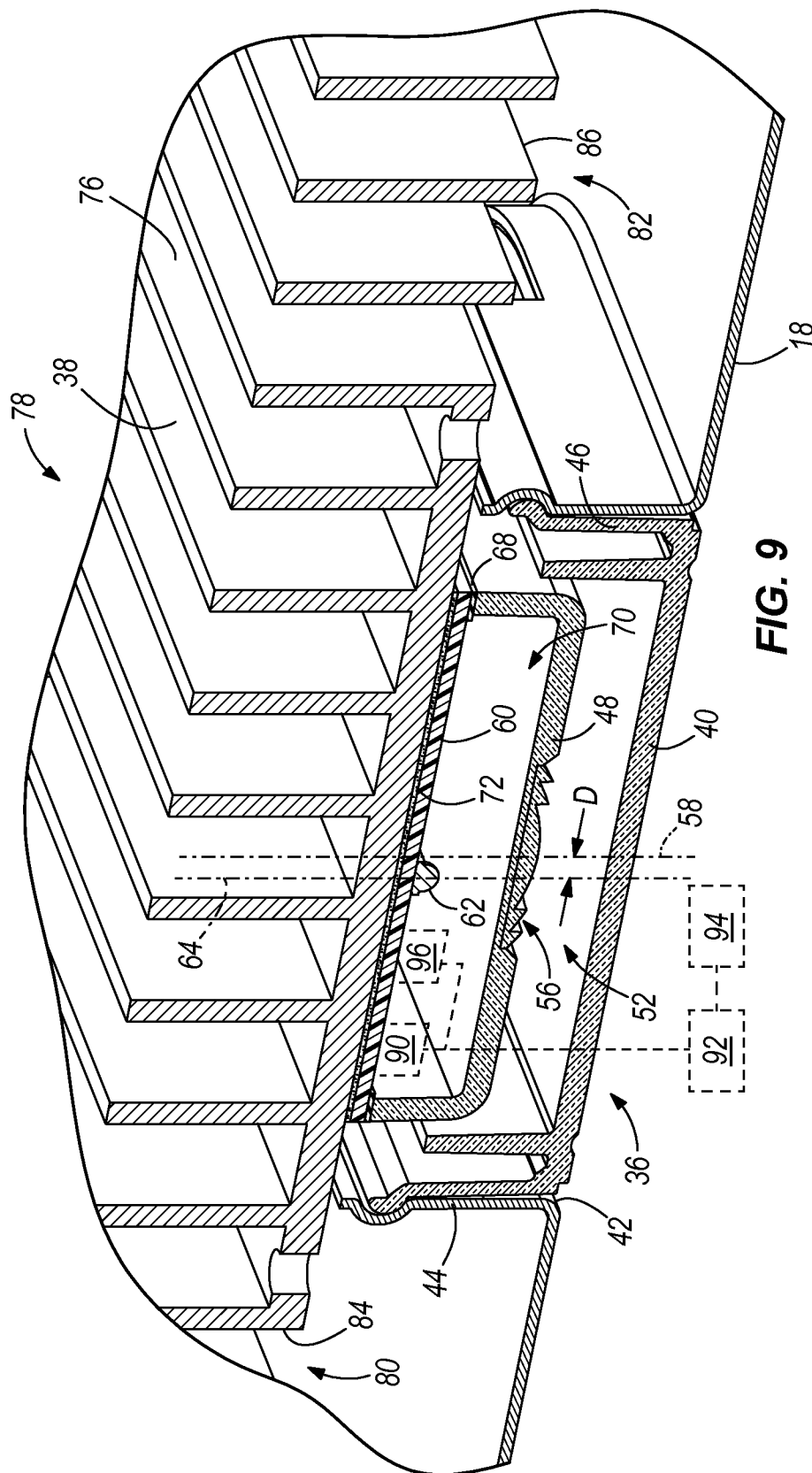


FIG. 8

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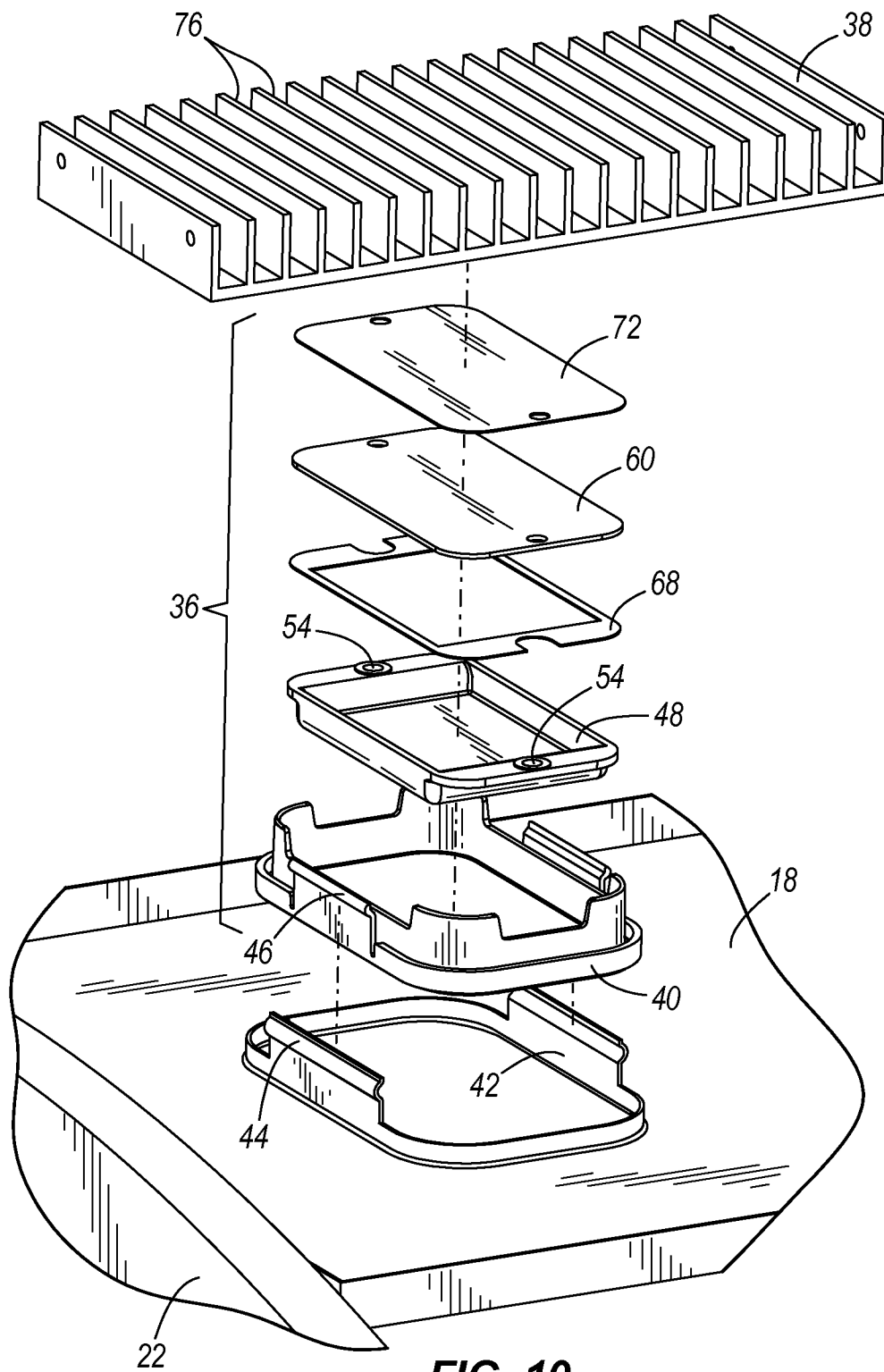


FIG. 10

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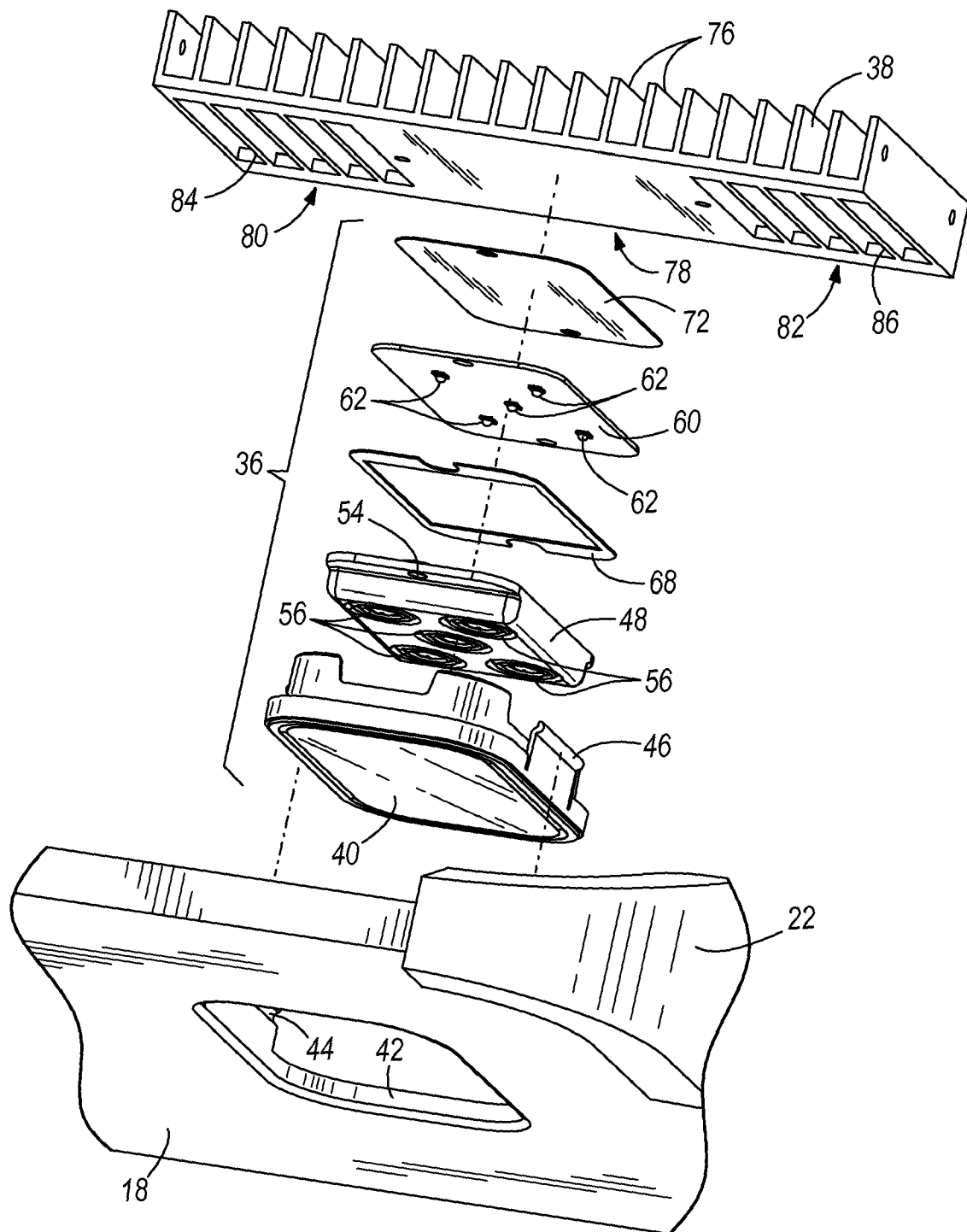


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/033958

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - F24C 15/20 (2010.01)

USPC - 126/299R

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) - F21S 8/00; F24C 15/20; F28F 1/10, 1/32 (2010.01)

USPC - 55/DIG36; 126/299R; 165/151, 152; 362/249.02, 294, 555, 580, 800

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2010/0051011 A1 (SHAFFER) 04 March 2010 (04.03.2010) entire document	1-21
Y	EP 2 098 778 A1 (CHEN) 09 September 2009 (09.09.2009) entire document	1-21
Y	US 5,099,914 A (REIFEL) 31 March 1992 (31.03.1992) entire document	2-3, 7, 10-11, 15-16
Y	US 2005/0152146 A1 (OWEN et al) 14 July 2005 (14.07.2005) entire document	5-6, 12-14, 17-21

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"&" document member of the same patent family

Date of the actual completion of the international search

23 June 2010

Date of mailing of the international search report

09 JUL 2010

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