

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
23 April 2009 (23.04.2009)

PCT

(10) International Publication Number
WO 2009/052172 A2

(51) International Patent Classification:
A47F 3/00 (2006.01) *H05B 33/00* (2006.01)

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(21) International Application Number:
PCT/US2008/079980

(22) International Filing Date: 15 October 2008 (15.10.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/999,037 15 October 2007 (15.10.2007) US

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: LED LIGHTING ASSEMBLY WITH LEDS HAVING DIFFERENT VIEWING ANGLES

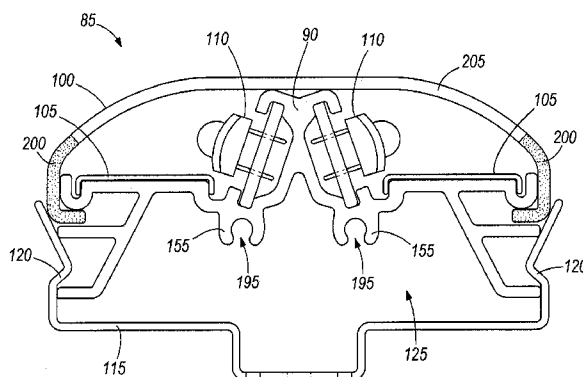


FIG. 3

(57) Abstract: A merchandiser that includes a case that defines a product display area and that includes a frame having mullions. The mullions define at least one opening such that the food product within the product display area is accessible from the front of the case. The merchandiser also includes at least one shelf for supporting and displaying food product within the product display area, and a light assembly that is coupled to at least one of the mullions and that is positioned to illuminate the food product. The light assembly includes a first LED that has a first viewing angle and a second LED that has a second viewing angle that is smaller than the first viewing angle.

WO 2009/052172 A2



Published:

- *without international search report and to be republished
upon receipt of that report*

LED LIGHTING ASSEMBLY WITH LEDS HAVING DIFFERENT VIEWING ANGLES

RELATED APPLICATIONS

[0001] This patent application claims priority to U.S. Patent Application Serial No. 60/999,037 filed October 15, 2007, the entire contents of which are hereby incorporated by reference.

BACKGROUND

[0002] The present invention relates to a refrigerated merchandiser that includes a light source. More particularly, the present invention relates to a refrigerated merchandiser including a light emitting diode (LED) light source to illuminate a product display area.

[0003] In conventional practice, commercial businesses such as supermarkets and convenience stores are equipped with refrigerated merchandisers. These merchandisers may be open or provided with doors and are used for presenting perishable food or beverages to customers while maintaining the fresh food or beverages in a refrigerated environment. Some refrigerated merchandisers have a narrow profile or footprint so that the merchandiser can be placed in the convenience store or supermarket store without taking up a large area of the store. This narrow profile results in a product display area having less depth compared to a standard-sized merchandiser. Typically, the refrigerated merchandisers include a light source that illuminates the product display area for better marketing of the food product and for higher visibility to the customers. However, the shelves inside the narrow profile merchandiser extend closer to the front of the product display area and thereby closer to the light sources creating undesirable lighting effects.

[0004] Conventional refrigerated merchandisers typically include a fluorescent light source to illuminate the product display area. Some merchandisers include fluorescent light sources that are coupled to a mullion of the merchandiser to direct light generally toward the food product in the product display area. The effectiveness of fluorescent light sources is dependent on the temperature of the application where the fluorescent light sources are used. In colder temperature conditions, the fluorescent light source has less light output than in application of the fluorescent light source in warmer temperature conditions. As a result, fluorescent light sources that are coupled to the mullions can have substantially reduced effective illumination of food product within the product display area.

[0005] The fluorescent light sources used in conventional merchandisers are relatively large, and reduce the amount of space in the merchandiser that can be allocated to displaying food product. In refrigerated merchandisers that have a narrow footprint, the large fluorescent light sources further limit the space available in the product display area for displaying food product. The close proximity of the relatively large mullion-mounted fluorescent light sources to shelves in the refrigerated merchandiser provide an imbalanced, uneven illumination of the product display area.

[0006] Other refrigerated merchandisers include light emitting diode (LED) light sources that are mounted to a mullion of the merchandiser to illuminate the product display area. In narrow profile refrigerated merchandisers, the mullion-mounted LED light sources are placed in very close proximity to the shelves. The close proximity of the existing LED light sources to the shelves causes an uneven, imbalanced distribution of light into the product display area. The existing LED light sources in narrow profile merchandisers only effectively illuminate a portion of the food product on the shelves. This results in spotlighting some food product on the shelves, and leaving other food product partially or substantially obscured due to the lack of uniform illumination of the entire product display area.

SUMMARY

[0007] The invention provides an improved merchandiser configured to illuminate a product display area effectively and efficiently. In one construction, the invention provides an improved light source that enables improved illumination of the product display area and reduces the energy required to condition the products within the merchandiser.

[0008] In another construction, the invention provides a merchandiser that includes a case that defines a product display area and that includes a frame that has mullions. The mullions define at least one opening such that the food product within the product display area is accessible from the front of the case. The merchandiser also includes at least one shelf for supporting and displaying food product within the product display area, and a light assembly that is coupled to at least one of the mullions and that is positioned to illuminate the food product. The light assembly includes a first LED that has a first viewing angle and a second LED that has a second viewing angle that is smaller than the first viewing angle.

[0009] In yet another construction, the merchandiser includes a light assembly that is coupled to at least one of the mullions and that is positioned to illuminate the food product. The light assembly includes a first LED that has a first viewing angle, and a second LED that has a second viewing angle that is different from the first viewing angle. The first LED and the second LED are positioned adjacent each other such that the first LED and the second LED are arranged in an alternating orientation along a length of the light assembly.

[0010] In yet another construction, the invention provides a method of illuminating food product supported by a merchandiser that includes a case that defines a product display area. The method includes providing a light assembly that is coupled to a mullion of the case. The light assembly includes a first LED that has a first viewing angle and a second LED that has a second viewing angle that is different from the first viewing angle. The method also includes partially illuminating the product display area by directing relatively diffuse light from the first LED into the product display area, and partially illuminating the product display area by directing a relatively pointed source of light from the second LED into the product display area.

[0011] Aspects of the invention will become apparent by consideration of the detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Fig. 1 is a perspective view of an exemplary merchandiser.

[0013] Fig. 2 is a perspective view of a mullion light assembly of the merchandiser of Fig. 1, including a housing, a lens cover, and LED light sources.

[0014] Fig. 3 is an end view of the mullion light assembly of Fig. 2.

[0015] Fig. 4 is a perspective view of the housing and the LED light sources of Fig. 2.

[0016] Fig. 5 is an end view of the housing and the LED light sources of Fig. 4.

[0017] Fig. 6 is an end view of the lens cover of Fig. 2.

[0018] Fig. 7 is a perspective view of one of the LED light sources of Fig. 5 including wide viewing angle LEDs and narrow viewing angle LEDs.

[0019] Fig. 8 is a schematic view of one of the wide viewing angle LEDs and one of the narrow viewing angle LEDs of Fig. 7.

[0020] Fig. 9 is an end view of a housing and a LED light source of another mullion light assembly of the refrigerated merchandiser of Fig. 1.

DETAILED DESCRIPTION

[0021] Before any constructions 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 constructions and of being practiced or of being carried out in various ways. 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. 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.

[0022] Fig. 1 shows a merchandiser 10 for displaying food product (e.g., frozen food, fresh food, beverages, etc.) available to consumers in a retail setting (e.g., a supermarket or grocery store). The merchandiser 10 includes a case 15 that has a base 20, side walls 25, a case top or canopy 30, and a rear wall 35. At least a portion of a refrigeration system (not shown) can be located within the case 15 to refrigerate the food product. In other constructions, a heating system can be located within the case 15 to heat the food product. The area partially enclosed by the base 20, the side walls 25, the case top 30, and the rear wall 35 defines a product display area 40. The food product is supported on shelves 45 within the product display area 40.

[0023] The case 15 includes a frame 50 adjacent a front of the merchandiser 10. Fig. 1 shows that the frame 50 includes vertical mullions 55 that define openings 60, and doors 65 positioned over the openings 60. The openings 60 and the doors 65 are configured to allow access to food product stored in the product display area 40. The mullions 55 are spaced

horizontally along the case 15 to provide structural support for the case 15. Each mullion 55 is defined by a structural member that can be formed from a non-metallic or metallic material. A handle 70 is positioned along an edge of each door 65 to move the door 65 between an open position and a closed position.

[0024] Each door 65 includes a frame 75 that attaches a translucent member 80 to the door 65 to allow viewing of the food product from outside the case 15. The translucent member 80 can be formed from glass, or alternatively, from other materials that are substantially translucent (e.g., acrylic, etc.). In some constructions, the case 15 includes a standard profile or footprint that has a depth (e.g., 41 inches) defined between the rear wall 35 and the doors 65. Generally, in standard profile cases, the mullions 55 are spaced apart a distance (e.g., 6 inches) from ends of the shelves 45. In other constructions, the case 15 may include a narrow profile or footprint to limit the area in the retail setting that is taken up by the merchandiser 10. In these constructions, the case 15 has a relatively shorter depth (e.g., 37 inches) between the rear wall 35 and the doors 65 when compared with the depth of standard profile cases. In the cases 15 that have a narrow profile, the mullions 55 are spaced apart from the ends of the shelves 45 a relatively shorter distance (e.g., 2 inches) when compared to the distance between the mullions 55 and the shelves 45 in standard profile cases. Generally, the mullions 55 of the narrow profile cases 15 are located in very close proximity to the shelves 45.

[0025] Figs. 2 and 3 show a mullion light assembly 85 that can be attached to each mullion 55 of the case 15 to illuminate the product display area 40. The mullion light assembly 85 includes a housing or shell 90, a translucent lens or cover 100, mirrors or specular members 105, and light emitting diode (LED) light sources 110. The housing 90 can be attached to each mullion 55 using a clip or retainer 115, or another similar fastener. The clip 115 can be coupled to the mullions 55 using fasteners (e.g., screws, bolts, etc.). As shown in Fig. 3, the clip 115 includes sidewall portions 120 that define a recess 125.

[0026] Figs. 3-5 show that the housing 90 is defined by an extruded body that is formed from a high-impact material that is resistant to breakage. As illustrated in Fig. 5, a first axis 130 passes through a middle of the mullion light assembly 85 and divides the light assembly 85 into a left-hand portion and a right-hand portion. The housing 90 extends along a substantial length of each mullion 55, and is generally symmetrical about the first axis 130.

As illustrated in Figs. 3 and 5, the left-hand portion is substantially a mirror image of the right-hand portion.

[0027] The housing 90 includes clip members 135 and attachment portions 140. The clip members 135 extend from sides of the extruded body to couple the housing 90 to the sidewall portions 120. The attachment portions 140 are disposed on each side of and extend from the extruded body.

[0028] Figs. 4 and 5 show that the housing 90 also includes mirror portions 145, light attachment portions 150, and extruded members 155. Each of the mirror portions 145 is disposed adjacent one light attachment portion 150, and is formed as part of the extruded body. The mirror portion 145 includes a first receiving portion 160, a second receiving portion 165, and a central portion 170 that interconnects the first receiving portion 160 and the second receiving portion 165. Each of the first receiving portions 160 is substantially “U”-shaped, and is disposed on an outer end of the extruded body. The first receiving portion 160 on each end of the extruded body forms a slot 175 that receives a portion of one of the mirrors 105. The first receiving portions 160 further cooperate with the associated attachment portion 140 to define a channel 180 that receives a respective end of the cover 100, and that attaches the cover 100 to the housing 90. Each of the second receiving portions 165 is defined on an end of the mirror portion 145 that is opposite the corresponding first receiving portion 160. The second receiving portions 165 are further disposed adjacent the light attachment portions 150.

[0029] The central portion 170 extends between the first receiving portion 160 and the second receiving portion 165, and is positioned in close proximity to or adjacent one of the light attachment portions 150. As shown in Fig. 5, the central portions 170 are substantially planar, and are disposed substantially horizontally and perpendicular to the first axis 130. In other constructions, the central portions 170 may be angularly spaced from the first axis 130 at other angles.

[0030] Fig. 5 shows that the light attachment portions 150 are formed as a part of the extruded body, and define a stepped recess 185 that is adjacent the central portion 170. A second axis 190 passes through an upper portion of each of the stepped recesses 185. The second axis 190 of each of the light attachment portions 150 is angularly spaced from the associated central portion 170, and defines a first angle α relative to the first axis 130. In the

illustrated construction, the first angle α is about 20 degrees. In other constructions, the first angle α can be larger or smaller than 20 degrees.

[0031] In some embodiments, the mullion light assembly 85 may include end caps that are attached to the housing to limit accumulation of debris on the mirrors 105 and the LED light sources 110. Generally, the end caps are removable from the housing 90. The extruded members 155 define channels 195 that are located on the extruded body adjacent and on an opposite side from the light attachment portions 150. The end caps are attached to the housing 90 within the channels 195 to cover the ends of the housing 90.

[0032] Fig. 6 shows that the cover 100 is attached to the housing 90 to protect the LED light sources 110 from debris or incidental contact. The cover 100 includes obscured portions 200 disposed on ends of the cover 100, and a substantially clear or transparent portion 205 that extends between the obscured portions 200. Light from the LED light sources 110 is at least partially diffused or blocked by the obscured portions 200 to obscure visibility of the LED light sources 110 from outside the merchandiser 10.

[0033] The mirrors 105 and the LED light sources 110 are generally directed at food product in the product display area 40. Figs. 3 and 5 show that each of the mirrors 105 is attached to the housing 90 within the first and second receiving portions 160, 165 and the central portion 170. In some constructions, the mirrors 105 can be attached to the first and second receiving portions 160, 165 and the central portion 170 using an adhesive (e.g., epoxy, glue, etc.). The mirrors 105 are formed from a reflective material (e.g., polished aluminum, polished stainless steel, chrome-plated steel, metallized polymer tape, etc.) to reflect light from the adjacent LED light source 110 into the product display area 40 without loss of luminescence. Generally, the reflectance capacity of the mirrors 105 is above about 70 percent reflectance to reflect a substantial amount of light from the LED light source into the product display area 40.

[0034] As shown in Fig. 4, each mirror 105 extends a substantial length of the mullion light assembly 85, and is substantially flat to conform to the substantially planar central portion 170. In some constructions, the mirrors 105 can have curved mirror surfaces that reflect light into the product display area 40.

[0035] Each LED light source 110 is in electrical communication with the case 15 through the mullion 55. Figs. 3-5 show that the LED light sources 110 are attached to the housing 90 within the stepped recesses 185 of the light attachment portions 150, and include circuit boards 210 that distribute power to and dissipate heat from the LED light sources 110. The circuit boards 210 are made from conventional printed circuit board material without being metal clad. In some constructions, the circuit boards 210 are formed without an aluminum heat sink. Power is supplied to the LED light sources 110 from a power supply (not shown).

[0036] The LED light source 110 that is attached to housing 90 on the left of the first axis 130 (as viewed in Fig. 5) is directed in a first direction away from the mullion 55 toward the product display area 40 on the left of the mullion 55. The LED light source 110 that is attached to the housing 90 on the right of the axis 130 (as viewed in Fig. 5) is directed in a second direction that is symmetrically opposite the first direction (i.e., away from the mullion 55 toward the product display area 40 on the right of the mullion 55). Generally, a portion of the light from each LED light source 110 is directed toward the product display area 40, and another portion of the light is directed toward the corresponding mirror 105, where the light is reflected and redirected toward the product display area 40. A small portion of the light from each LED light source 110 may be blocked by the obscured portions 200 such that it does not get directed toward an individual reaching into the product display area 40. The mirrors 105 and the LED light sources 110 cooperate to define a multi-directional light assembly 85.

[0037] As illustrated in Fig. 7, each of the LED light sources 110 also includes first LED packages 215 and second LED packages 220. The first and second LED packages 215, 220 are spaced at predetermined distances along the circuit board 210. For example, the first and second LED packages 215, 220 can be defined by an area of about 0.5 inches by 0.5 inches. Each LED package 215, 220 can include any number of LEDs. In some constructions, each LED package 215, 220 can include three LEDs. In other constructions, each LED package 215, 220 may include fewer or more than three LEDs. In still other constructions, the LEDs in each LED package 215, 220 can be low current LEDs (e.g., 15mA). The quantity of the LEDs is determined by the lighting necessary to illuminate the product display area 40. In constructions where the LED packages 215, 220 contain more than a single LED, the LEDs within each LED package 215, 220 can be the same or different-colored LEDs.

[0038] The first LED packages 215 and the second LED packages 220 are arranged in and define an alternating pattern along the length of the circuit board 210. As viewed in Fig. 7, a first LED package 215 is disposed on the left-most end of the circuit board 210. Moving from left to right on the circuit board 210 (as viewed in Fig. 7), a second LED package 220 is disposed adjacent and to the right of the first LED package 215. Continuing to the right, another first LED package 215 is disposed adjacent the second LED package 220. As illustrated in Fig. 7, every other LED package along the length of the circuit board is a second LED package 220. Thus, every other LED package that is not a second LED package 220 is a first LED package 215. In other words, the alternating arrangement of the LED light sources 110 positions a second LED package 220 between two first LED packages 215.

[0039] Other arrangements of the first and second LED packages 215, 220 are also possible, and considered herein. For example, the pattern of alternation between the LED packages 215, 220 along the length of the circuit board 210 may be: (i) a consistent pattern of equal LED packages (e.g., one by one, two by two, or any other consistent pattern repeating the same number of LED packages 215, 220 in series); (ii) a consistent pattern of unequal numbers of LED packages (e.g., one by two, two by three, or any other consistent pattern repeating the same unequal number of LED packages 215, 220 in series); and an inconsistent pattern of equal and/or unequal numbers of LED packages.

[0040] With reference to Figs. 5 and 8, a third axis 225 passes through a center of each LED package 215, 220. The third axis 225 is defined as a zero axis along which light from the LED package 215, 220 is generally distributed outward from the housing 90 into the product display area 40. As illustrated in Fig. 5, the third axis 225 is substantially perpendicular to the second axis 190, and is further angularly spaced from the horizontally disposed central portion 170.

[0041] Generally, the first LED packages and the second LED packages can include the same or different LEDs. As illustrated in Fig. 7, a lens 230 is coupled to each of the second LED packages 220 to narrow the viewing angle of the second LED packages 220. In some constructions, the lens 230 is formed from a clear epoxy resin that has a high light transmittance value. In other constructions, the lens 230 can be formed from a hard silicone-based material. In still other constructions, the lens 230 may be formed from a plastic (e.g., polycarbonate).

[0042] Fig. 8 shows that the first LED packages 215 include a first viewing angle θ , and that the second LED packages 220 include a second viewing angle β . The first viewing angle θ is a wide viewing angle that is defined as the full angle at which the brightness of the first LED package 215 is half of the brightness directed from the center of the LED package 215 (i.e., the brightness along the third axis 225). In other words, the brightness within the first viewing angle θ is at least fifty percent of the brightest light, which is directed along the axis 225, while the brightness of the light outside the first viewing angle θ is less than fifty percent of the brightest light. A fourth axis 235 defines an angle relative to the third axis 225 at which the brightness of the first LED package 215 is one-half of the brightness of the first LED package 215 that is distributed along the third axis 225. The angle between the third axis 225 and the fourth axis 235 is approximately equal to one-half of the first viewing angle θ . In some constructions, the first viewing angle θ is between about 120 degrees and 140 degrees. In other constructions, the first viewing angle θ can be between about 90 degrees and 180 degrees. Other angles for the first viewing angle θ are also possible, and considered herein.

[0043] The second viewing angle β is a narrow viewing angle. Similar to the first viewing angle θ , the second viewing angle β is defined as the full angle at which the brightness of the second LED package 220 is half of the brightness directed from the center of the LED package 220 (i.e., the brightness along the third axis). In other words, the brightness within the second viewing angle β is at least fifty percent of the brightest light, which is directed along the axis 225, while the brightness of the light outside the second viewing angle β is less than fifty percent of the brightest light. A fifth axis 240 defines an angle relative to the third axis 225 at which the brightness of the second LED package 220 is one-half of the brightness of the second LED package 220 that is distributed along the third axis 225. The angle between the third axis 225 and the fifth axis 240 is approximately equal to one-half of the second viewing angle β . In some constructions, the second viewing angle β is between about 20 degrees and 40 degrees. In other constructions, the second viewing angle β can be between about 5 degrees and 60 degrees. Other angles for the second viewing angle β are also possible, and considered herein.

[0044] Generally, the relatively narrow or smaller viewing angle β of the second LED packages 220, as compared to the viewing angle θ , concentrates or focuses the light produced by the LEDs in the second LED packages 220. The more concentrated light of the second

LED packages 220 increases the brightness of the LED packages 220 closer to the third axis 225. The increased brightness allows the relatively narrow, bright light produced by the second LED packages 220 to be distributed over a relatively long distance. In some constructions, the increased brightness of the second LED packages 220 closer to the third axis 225 creates a substantially pointed source of light.

[0045] Fig. 9 shows another construction of a mullion light assembly 250 that can be used on the merchandiser 10 adjacent an end of the case 15. Except as described below, the mullion light assembly 250 is similar to the mullion light assembly 85 described with regard to Figs. 2-8, and common elements are given the same reference numerals. As illustrated in Fig. 9, an axis 255 divides the mullion light assembly 250 into a right-hand portion and a left-hand portion.

[0046] The mullion light assembly 250 includes the mirror 105, the LED light source 110, a housing 260, and a translucent cover 265 that can be attached to the housing 260. The housing 260 is defined by an extruded body that can be attached to the interior side of each end mullion 55 using a clip 270 that has sidewall portions 275 that define a recess 280 to attach the housing 260 to the mullion 55. The cover 265 is similar to the cover 100, and includes an obscured portion 282, and a transparent portion 283.

[0047] The right-hand portion of the mullion light assembly 250 is generally the same as the right-hand portion of the mullion light assembly 85 described with regard to Fig. 4. Specifically, the right-hand portion of the housing 260 is substantially similar to the right-hand portion of the housing 90, except that the extruded members 155 are located in different positions. For example, one extruded member 155 is positioned adjacent and opposite the clip member 135 and the attachment portion 140 on the right-hand portion of the housing 265. The left-hand portion of the housing further defines an attachment portion 285 that attaches the cover 265 to the housing 260. The other extruded member 155 is located adjacent and opposite the attachment portion 285 on the left-hand portion. The extruded members 155 can be located anywhere on the housing 260 as long as end caps of the mullion light assembly 250 can be attached to the ends of the housing 260.

[0048] The mirror 105 is attached to the housing 260 within the first and second receiving portions 160, 165, and is only located on one side of the housing 260 due to the mullion light assembly 250 being located on the end of the case 15. The LED light source 110 is attached

to the housing 260 within the stepped recess 185 of the light attachment portion 150, and a portion of the light from the LED light source 110 is aimed directly at the product display area 40. Another portion of the light from the LED light source 110 is directed at the mirror, where light is reflected into the product display area 40.

[0049] In operation, the opposed, multi-directional mullion light assembly 85 uniformly illuminates the product display area 40 while being substantially hidden from view. A first portion of the light directed from the LED light source 110 that is coupled to the housing 90 within the left-hand stepped recess 185 directly illuminates the product display area 40 to the left of the mullion 55. A second portion of the light directed from this LED light source 110 is reflected by the mirror 105 in a direction that is also generally toward the product display area 40 to the left of the mullion 55. Similarly, a first portion of light directed from the LED light source 110 that is coupled to the right-hand stepped recess 185 directly illuminates the product display area 40 to the right of the mullion 55. A second portion of light directed from this LED light source 110 is reflected by the mirror 105 in a direction that is also generally toward the product display area 40 to the right of the mullion 55.

[0050] The first LED packages 215 direct light substantially uniformly over the first viewing angle θ toward the shelves 45 so that food product on the shelves 45 can be generally illuminated. The first viewing angle θ of the first LED packages 215 provides substantial illumination of food product that is located adjacent and behind the mullions 55. The first viewing angle θ further allows the first LED packages 215 to direct at least partially diffuse light over a relatively wide viewing angle to uniformly illuminate food product. In other words, the projection of the light from the first LED packages 215 is generally wide and over a relatively short distance.

[0051] The second LED packages 220 direct light substantially toward food product on the shelves 45 over the second viewing angle β . Generally, the relatively narrow viewing angle of the second LED packages 220 focus the light toward the shelves to illuminate food product that is located adjacent a center of the shelves 45 between the mullions 55. The second LED packages 220 generally distribute or direct light at food product on the shelves 45 as substantially pointed sources of light when compared to the relatively diffuse light distributed by the first LED packages 215. In other words, the projection of the light from the second LED packages 220 is generally narrow and over a relatively long distance.

[0052] The alternating arrangement of the first LED packages 215 and the second LED packages 220 substantially uniformly illuminates the product display area 40. By alternating the LED packages 215, 220, food product in the refrigerated merchandiser 10 can be effectively illuminated without taking up a large amount of space in the product display area 40. The more diffuse, wide viewing angle source of light via the first LED packages 215 cooperate with the more direct, narrow viewing angle source of light via the second LED packages 220 to illuminate a the product display area.

[0053] The mullion light assemblies 85, 250 can be used together or separately with other light assemblies (not shown) in the merchandiser 10 to illuminate the product display area 40. Use of low current LED packages 215, 220 in each mullion light assembly 85, 250 provides substantial energy savings. Generally, the overall power required to illuminate and to refrigerate the case 15 using the LED light sources 110 is lower than the power required by cases that use fluorescent light sources. The low current LED light assemblies 85, 250 also can be used to replace existing fluorescent of existing merchandisers to provide similar illumination of the product display area 40 via more economical means.

[0054] Various features and advantages of the invention are set forth in the following claims.

CLAIMS

1. A merchandiser comprising:
 - a case defining a product display area and including a frame having mullions defining at least one opening such that the food product within the product display area is accessible from the front of the case;
 - at least one shelf for supporting and displaying food product within the product display area; and
 - a light assembly coupled to at least one of the mullions and positioned to illuminate the food product, the light assembly including a first LED having a first viewing angle and a second LED having a second viewing angle that is smaller than the first viewing angle.
2. The merchandiser of claim 1, wherein the light assembly further includes a cover disposed adjacent the first LED and the second LED, and wherein the cover includes at least one obscured portion such that the visibility of light from the first LED and the second LED from outside the case is partially obscured.
3. The merchandiser of claim 1, wherein the light assembly further includes at least one reflective element positioned adjacent the first LED and the second LED such that at least a portion of light from the first LED and the second LED is reflected by the reflective element into the product display area.
4. The merchandiser of claim 1, wherein the first viewing angle is between about 90 degrees and 180 degrees.
5. The merchandiser of claim 1, wherein the second viewing angle is between about 5 degrees and 60 degrees.
6. The merchandiser of claim 1, wherein the first LED is directed in a first direction away from the corresponding mullion generally toward the product display area, and wherein the second LED is directed in a second direction substantially symmetrically opposite the first direction and generally toward the product display area.

7. The merchandiser of claim 1, wherein the light assembly includes at least one circuit board coupled to the first LED and the second LED, and wherein the circuit board is operable to dissipate heat from the first LED and the second LED without being metal clad.
8. The merchandiser of claim 1, further comprising a lens covering the second LED to narrow the viewing angle of the second LED.
9. The merchandiser of claim 8, wherein the lens is formed from at least one of an epoxy resin, a hard silicone-based material, and plastic.
10. The merchandiser of claim 1, wherein the first LED is operable to direct relatively diffuse light into the product display area, and wherein the second LED is operable to direct a substantially pointed source of light into the product display area.
11. The merchandiser of claim 10, wherein the relatively diffuse light from first LED is operable to illuminate food product that is located adjacent and behind the corresponding mullion, and wherein the substantially pointed source of light from the second LED is operable to illuminate food product that is located adjacent a center of the shelf between the mullions.

12. A merchandiser comprising:
 - a case defining a product display area and including a frame having mullions that define at least one opening such that the food product within the product display area is accessible from the front of the case;
 - at least one shelf for supporting and displaying the food product within the product display area;
 - a light assembly coupled to at least one of the mullions and positioned to illuminate the food product, the light assembly including a first LED having a first viewing angle, and a second LED having a second viewing angle that is different from the first viewing angle, the first LED and the second LED positioned adjacent each other along a length of the light assembly.
13. The merchandiser of claim 12, wherein the light assembly further includes a circuit board, and wherein the first LED and the second LED are positioned adjacent each other along the length of the circuit board.
14. The merchandiser of claim 13, wherein the circuit board is operable to dissipate heat from the first LED and the second LED without being metal clad.
15. The merchandiser of claim 12, further comprising a lens covering the second LED to define the second viewing angle of the second LED.
16. The merchandiser of claim 12, wherein the first LED is one of a plurality of first LEDs and the second LED is one of a plurality of second LEDs, and wherein the plurality of first LEDs and the plurality of second LEDs are arranged in an alternating orientation defined by a consistent pattern of equal quantities of the plurality of first LEDs and the plurality of second LEDs.
17. The merchandiser of claim 12, wherein the first LED is one of a plurality of first LEDs and the second LED is one of a plurality of second LEDs, and wherein the plurality of first LEDs and the plurality of second LEDs are arranged in an alternating orientation defined by a consistent pattern of unequal quantities of the plurality of first LEDs and the plurality of second LEDs.

18. The merchandiser of claim 12, wherein the first LED is one of a plurality of first LEDs and the second LED is one of a plurality of second LEDs, and wherein the plurality of first LEDs and the plurality of second LEDs are arranged in an alternating orientation defined by an inconsistent pattern of equal quantities of the plurality of first LEDs and the plurality of second LEDs.

19. The merchandiser of claim 12, wherein the first LED is one of a plurality of first LEDs and the second LED is one of a plurality of second LEDs, and wherein the plurality of first LEDs and the plurality of second LEDs are arranged in an alternating orientation defined by an inconsistent pattern of unequal quantities of the plurality of first LEDs and the plurality of second LEDs.

20. The merchandiser of claim 12, wherein the light assembly further includes a cover disposed adjacent the first LED and the second LED, and wherein the cover includes at least one obscured portion such that the visibility of light from the first LED and the second LED from outside the case is partially obscured.

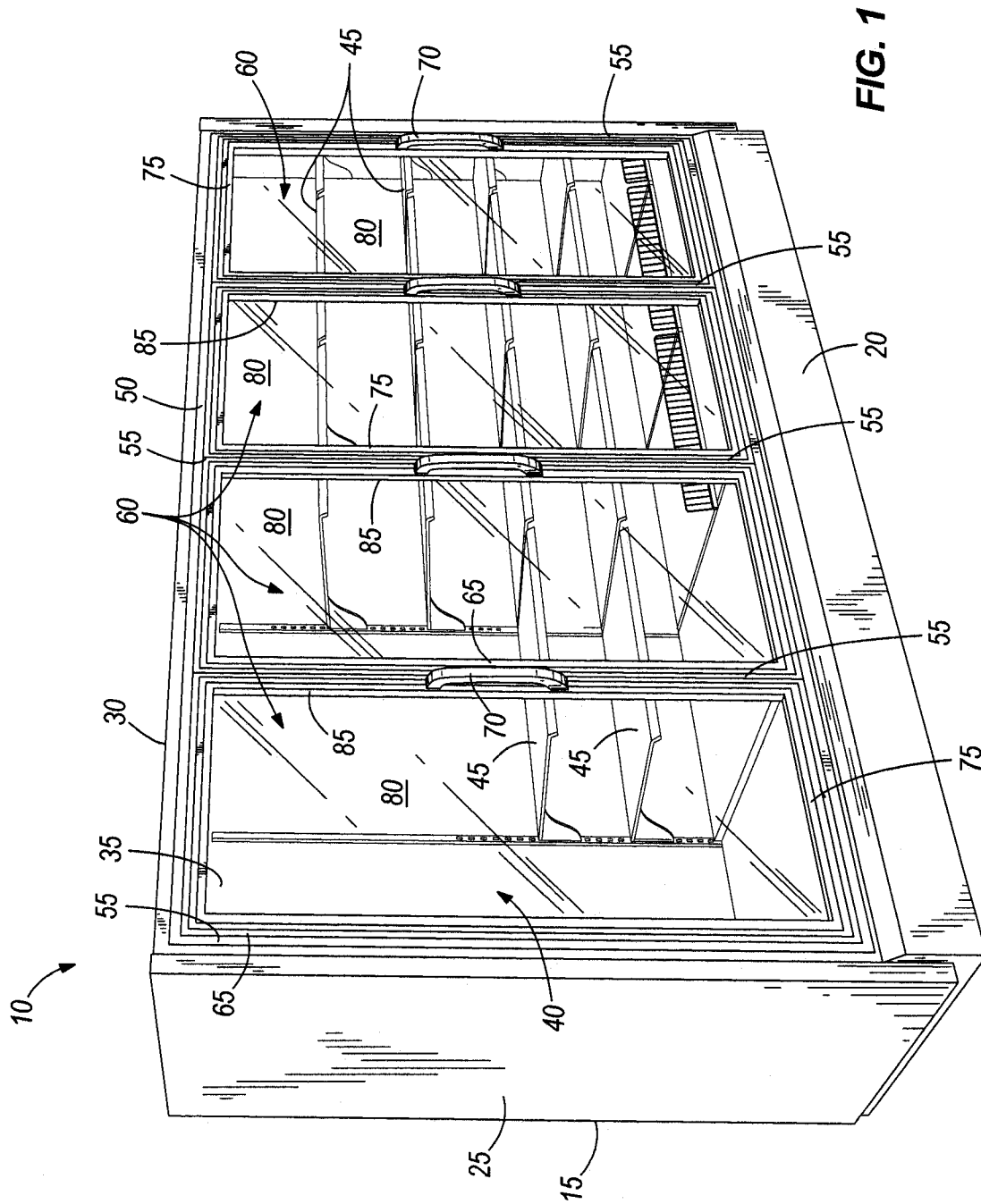
21. The merchandiser of claim 12, wherein the light assembly further includes a reflective element positioned adjacent the first LED and the second LED such that at least a portion of light from the first LED and the second LED is reflected by the reflective element into the product display area.

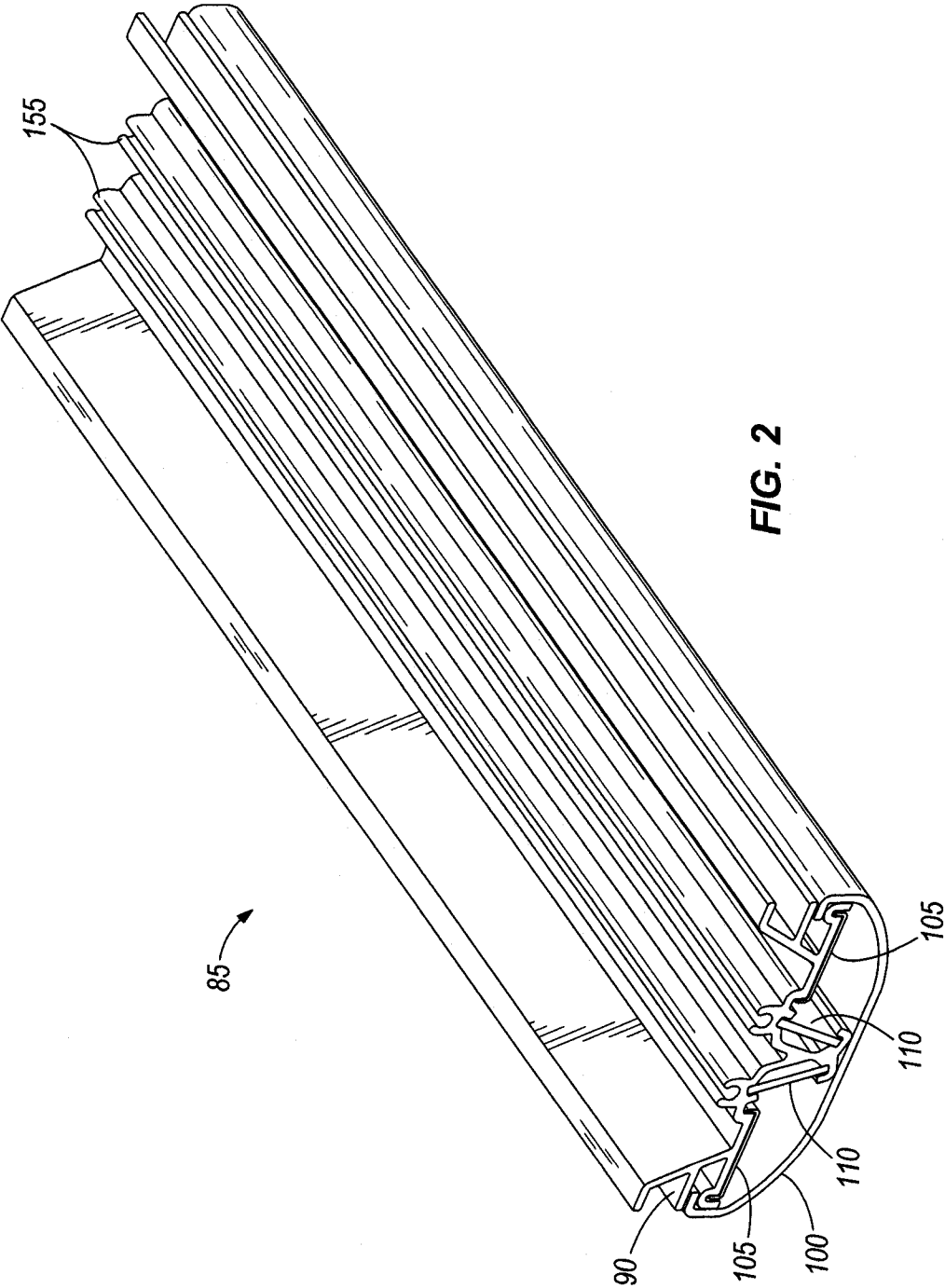
22. The merchandiser of claim 12, wherein the first viewing angle is larger than the second viewing angle.

23. The merchandiser of claim 12, wherein the first LED is directed in a first direction away from the corresponding mullion generally toward the product display area, and wherein the second LED is directed in a second direction substantially symmetrically opposite the first direction and generally toward the product display area.

24. The merchandiser of claim 12, wherein the first LED is operable to direct relatively diffuse light into the product display area, and wherein the second LED is operable to direct a substantially pointed source of light into the product display area.

25. The merchandiser of claim 24, wherein the first LED is operable to illuminate food product that is located adjacent and behind the corresponding mullion, and wherein the second LED is operable to illuminate food product that is located adjacent a center of the shelf between the mullions.





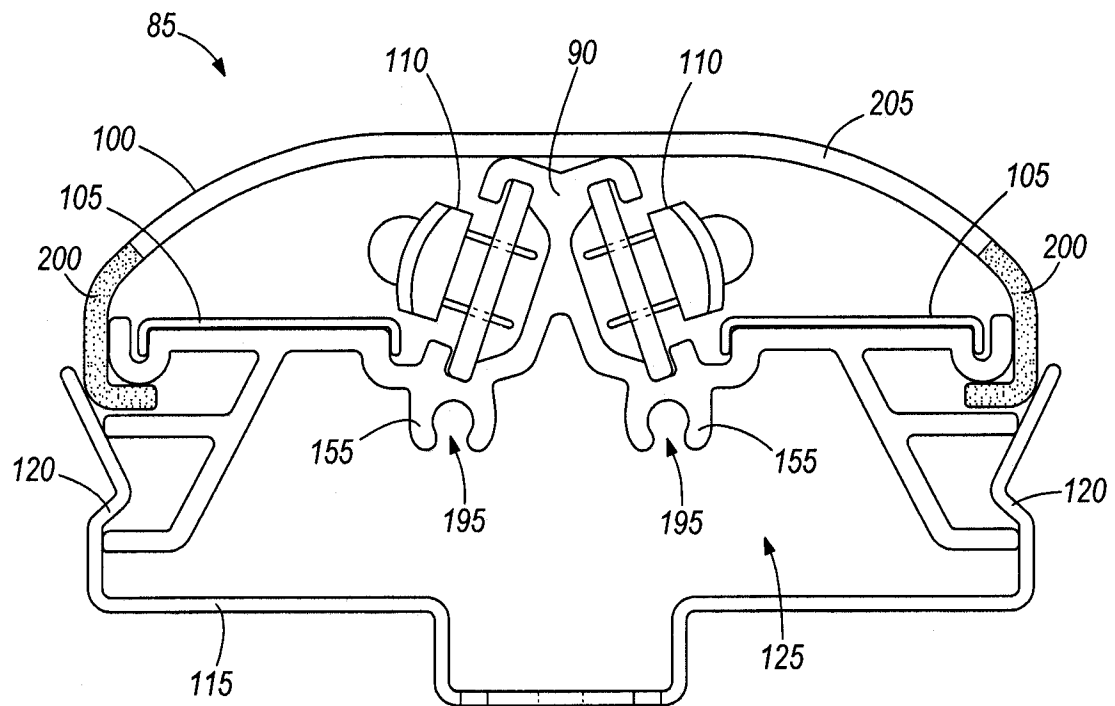


FIG. 3

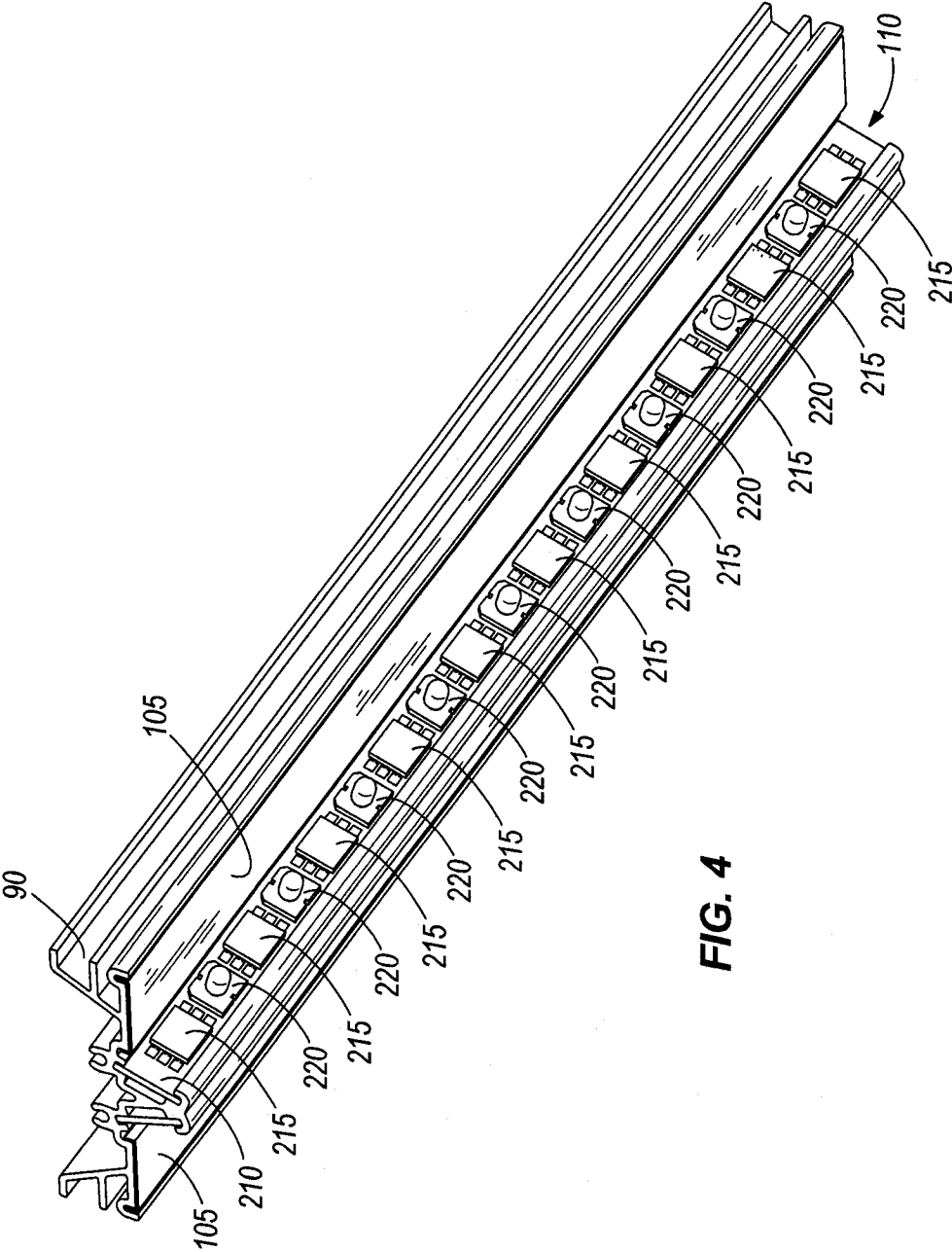


FIG. 4

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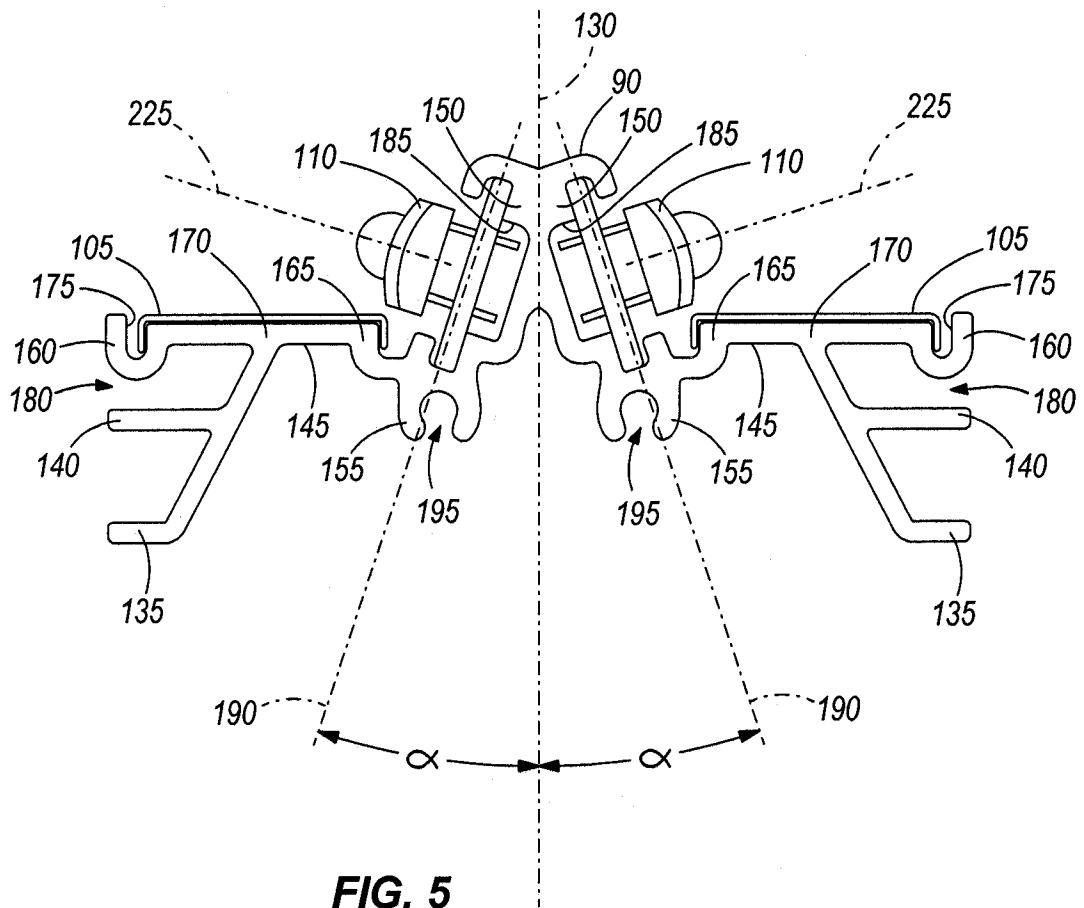


FIG. 5

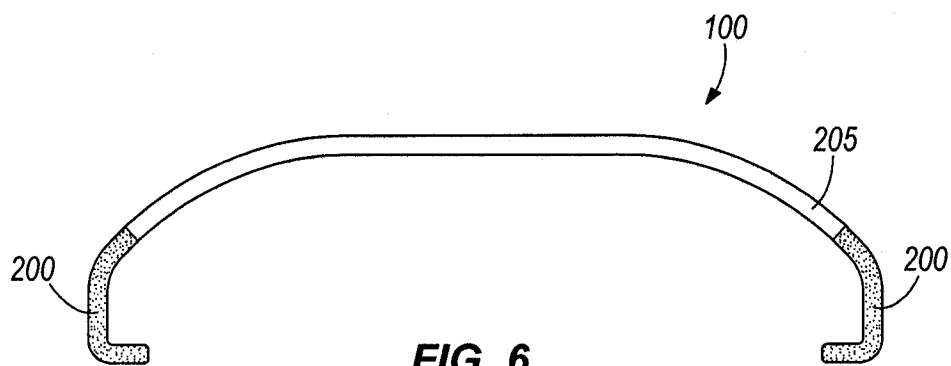


FIG. 6

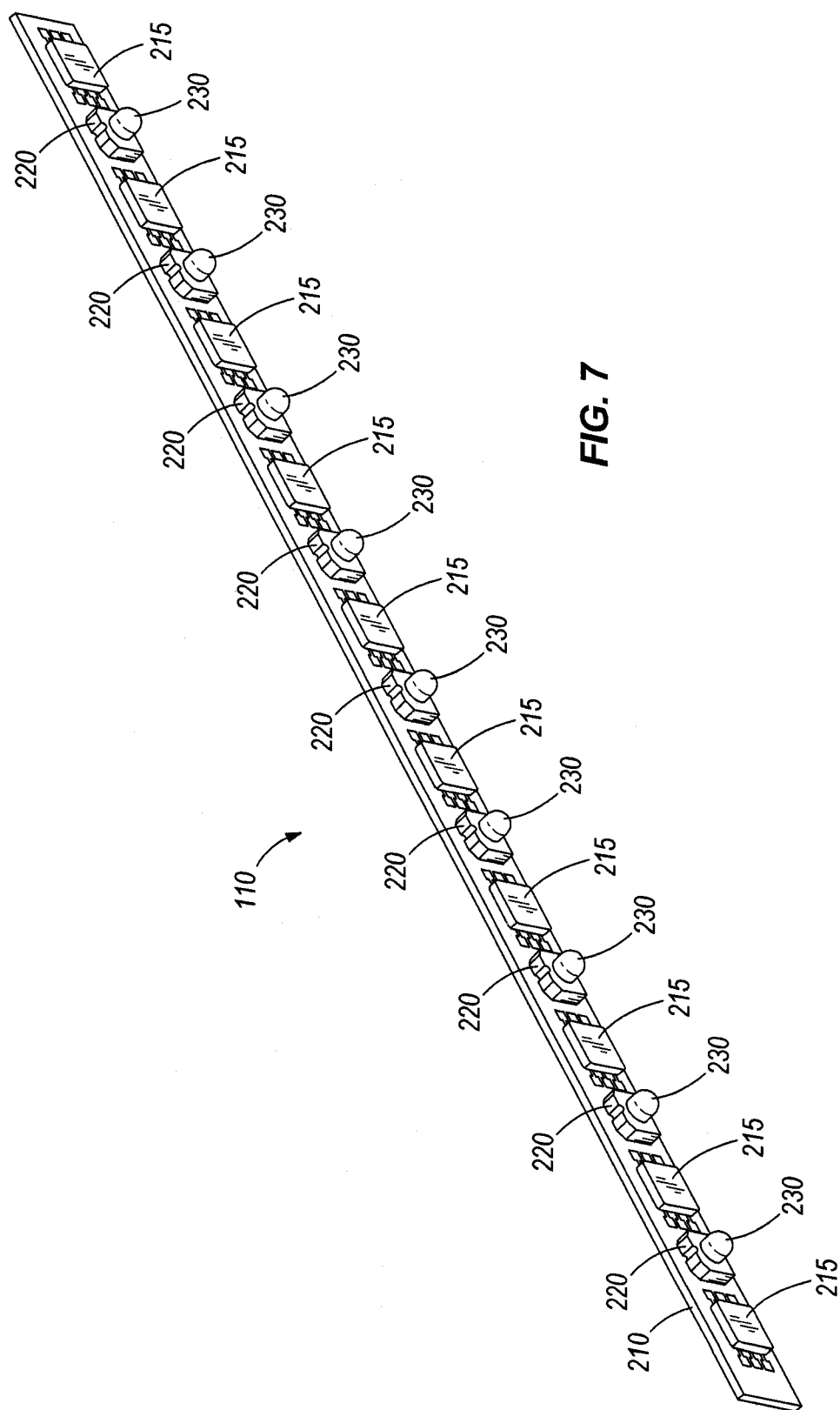
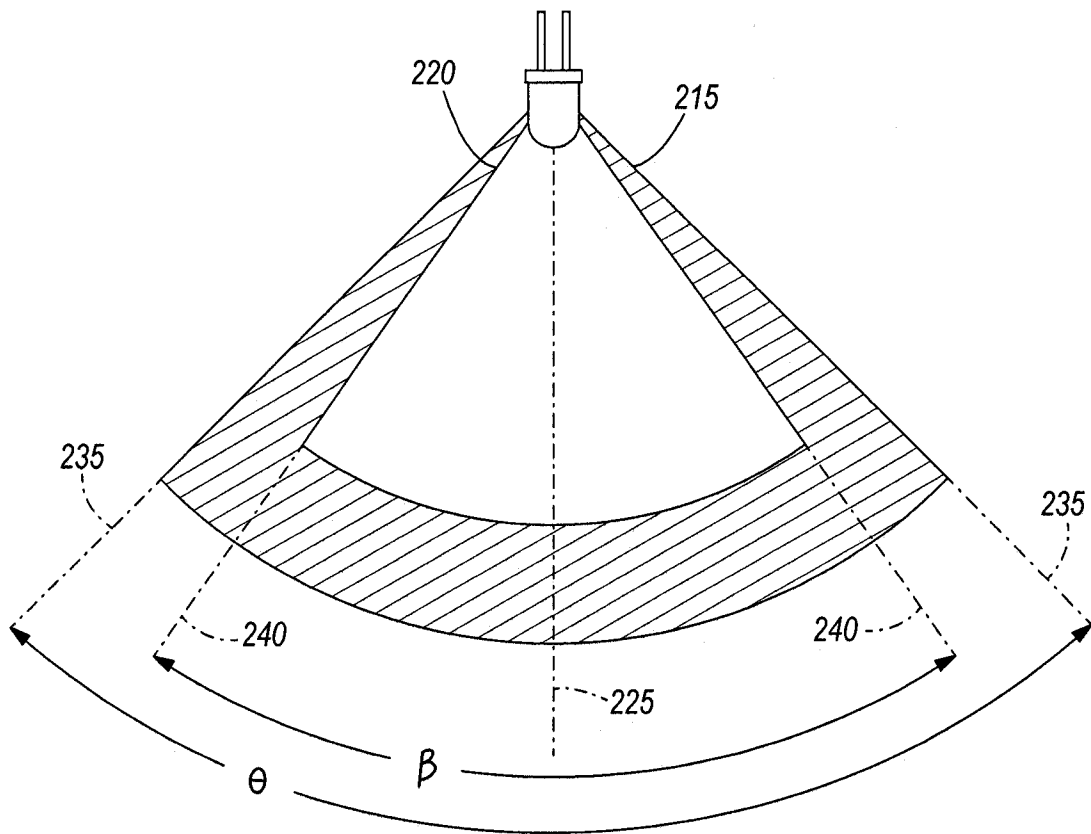


FIG. 7

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**FIG. 8**

