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[Continued on next page]

(54) Title: REARVIEW DEVICE

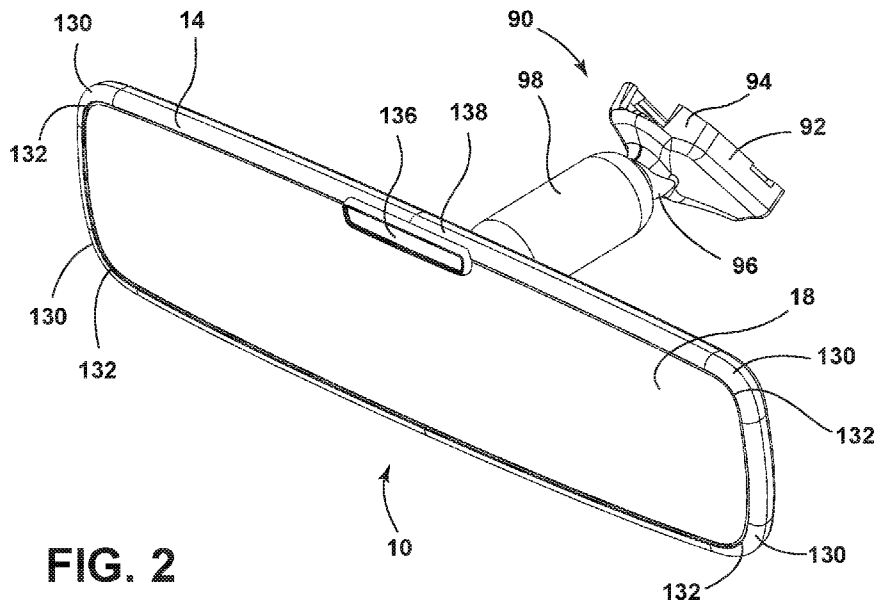


FIG. 2

(57) Abstract: A rearview device includes a housing that includes a first side and a second side opposite the first side. An electro-optic element is operably coupled with the first side of the housing. A rear trim bezel is disposed on the second side of the housing. A rear trim plate is operably coupled with the second side of the housing. A peripheral gap is defined between the rear trim plate and the second side of the housing. A spacing truss is disposed in the peripheral gap. The spacing truss includes first and second lateral walls extending to the rear trim bezel.



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REARVIEW DEVICE

BACKGROUND OF THE DISCLOSURE

[0001] The present disclosure generally relates to a rearview device, and more particularly, to an electro-optic element for a rearview device.

SUMMARY OF THE DISCLOSURE

[0002] One aspect of the disclosure includes a rearview device having a housing that includes a first side and a second side opposite the first side. An electro-optic element is operably coupled with the first side of the housing. A rear trim bezel is disposed on the second side of the housing. A rear trim plate is operably coupled with the second side of the housing. A peripheral gap is defined between the rear trim plate and the second side of the housing. A spacing truss is disposed in the peripheral gap. The spacing truss includes first and second lateral walls extending to the rear trim bezel.

[0003] Another aspect of the disclosure includes a rearview device having a housing that includes a front side and a rear side opposite the front side. An electro-optic element is operably coupled with the housing and is engaged with the front side. A trim bezel is disposed on the rear side of the housing behind the electro-optic element. A rear trim plate is operably coupled with the rear side of the housing. A peripheral gap is defined between the rear trim plate and the rear side of the housing.

[0004] Still another aspect of the disclosure includes a rearview device having a housing that includes a first side and a second side opposite the first side. An electro-optic element is operably coupled with the housing and is engaged with the first side. A printed circuit board is disposed inside the housing and includes a forward side and a rearward side. The printed circuit board includes a light pipe that conveys light directed at the electro-optic element to the rearward side of the printed circuit board.

[0005] These and other features, advantages, and objects of the present disclosure will be further understood and appreciated by those skilled in the art by reference to the following specification, claims, and appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0006] FIG. 1 is a top rear perspective view of one embodiment of a rearview device of the present disclosure;
- [0007] FIG. 2 is a front top perspective view of the rearview device of FIG. 1;
- [0008] FIG. 3 is a side elevational view of the rearview device of FIG. 1;
- [0009] FIG. 4 is a top plan view of the rearview device of FIG. 1;
- [0010] FIG. 5 is a top plan view of the rearview device of FIG. 1 with the mounting assembly removed;
- [0011] FIG. 6 is a rear elevational view of the rearview device of FIG. 1 with the mounting assembly removed;
- [0012] FIG. 7 is a top rear perspective exploded view of one embodiment of a rearview device of the present disclosure;
- [0013] FIG. 8 is a side elevational cross-sectional view of one embodiment of a rearview device of the present disclosure; and
- [0014] FIG. 9 is a partial top plan cross-sectional view of a portion of a rearview device of the present disclosure.

DETAILED DESCRIPTION

- [0015] For purposes of description herein, the terms “upper,” “lower,” “right,” “left,” “rear,” “front,” “vertical,” “horizontal,” and derivatives thereof shall relate to the disclosure as oriented in FIG. 1. However, it is to be understood that the disclosure may assume various alternative orientations, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification are simply exemplary embodiments of the inventive concepts defined in the appended claims. Hence, specific dimensions and other physical characteristics relating to the embodiments disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise.
- [0016] In this document, relational terms, such as first and second, top and bottom, and the like, are used solely to distinguish one entity or action from another entity or action, without necessarily requiring or implying any actual such relationship or order between such entities or actions. The terms “comprises,” “comprising,” or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises a list of elements does not include only those

elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element preceded by “comprises . . . a” does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that comprises the element.

[0017] As used herein, the term “and/or,” when used in a list of two or more items, means that any one of the listed items can be employed by itself, or any combination of two or more of the listed items can be employed. For example, if a composition is described as containing components A, B, and/or C, the composition can contain A alone; B alone; C alone; A and B in combination; A and C in combination; B and C in combination; or A, B, and C in combination.

[0018] Referring now to FIGS. 1-8, reference numeral 10 generally designates a rearview device having a housing 12 that includes a first side 14 and a second side 16 opposite the first side 14. An electro-optic element 18 is operably coupled with the first side 14 of the housing 12. A rear trim bezel 20 is disposed on the second side 16 of the housing 12. A rear trim plate 22 is operably coupled with the second side 16 of the housing 12. A peripheral gap 24 is defined between the rear trim plate 22 and the second side 16 of the housing 12. A spacing truss 26 is disposed in the peripheral gap 24. The spacing truss 26 includes first and second lateral walls 30, 32 extending to the rear trim bezel 20.

[0019] Referring now to the embodiment depicted in FIGS. 1, 2, and 8, the rearview device 10 includes the electro-optic element 18. A first substantially transparent substrate 40 includes first and second surfaces 42, 44 (FIG. 9) disposed on opposite sides thereof. The second surface 44 includes a first electrically conductive layer 48. A second substantially transparent substrate 50 includes third and fourth surfaces 52, 54 disposed on opposite sides thereof. The third surface 52 includes a second electrically conductive layer 56. An electro-optic medium 60 is disposed in a cavity 62 between the first substantially transparent substrate 40 and the second substantially transparent substrate 50. The electro-optic medium 60 is variably transmissive such that the electro-optic medium 60 is operable between generally clear and darkened states. A display device may be disposed proximate the electro-optic element 18.

[0020] Referring again to FIGS. 1-3, the rearview device 10 generally includes a mounting assembly 90 having a mount 92 configured to engage a windshield button. The windshield button may be generally secured via an adhesive or other method of

connection to a windshield of a vehicle. The mount 92 includes a base 94 and a mount ball 96 that projects from the base 94 and is received by a mount barrel 98. The mount barrel 98 engages the mount ball 96 of the mount 92, as well as a device ball 100 (FIG. 4) that is operably coupled with a rear portion 102 of the rearview device 10. The device ball 100 includes an engagement portion 104 configured to be secured with a mounting area 105 of the rear trim plate 22 of the rearview device 10 includes a receiving member (socket). It will also be understood that the mounting assembly 90 may be a single ball mount in which the rear portion 102 of the rearview device 10 directly engages the mount ball 96 of the mount 92.

[0021] With reference again to FIGS. 1, 2, 4, and 6, the rearview device 10 includes an ambient light sensor 110 that receives light through an aperture 112 that extends through the rear trim plate 22. The rear trim plate 22 includes an intermediate portion 114 and a peripheral flange 116. The peripheral flange 116 extends around the intermediate portion 114. The intermediate portion 114 also includes aesthetic portions 118 that are generally disposed on first and second sides 120, 122 of the device ball 100. In FIGS. 1 and 2, the housing 12 extends from the rear portion 102 of the rearview device 10 to a forward portion 121 (FIG. 5) of the rearview device 10, and includes a front recess 123 (FIGS. 8 and 9) configured to receive the electro-optic element 18. It will generally be understood that the electro-optic element 18 could be replaced with a prism-type element or other display-type element suitable for use in providing a rear view to an occupant in a vehicle. Because the housing 12 extends around and receives the electro-optic element 18, the rearview device 10 is free of a separate peripheral bezel. However, as previously noted, the rearview device 10 does include a rear trim bezel 20 that is visible from a rear side of the housing 12. Notably, the rear trim bezel 20 is not generally visible from a front of the housing 12 along a line of sight perpendicular to the planar extent of the electro-optic element 18.

[0022] The housing 12 generally includes a plurality of rounded corners 130 that may be generally complementary in shape to rounded corners 132 of the electro-optic element 18. In addition, a badge 136 is positioned over a top forward edge 138 of the housing 12 and the first surface 42 of the electro-optic element 18. It is generally contemplated that the badge 136 will be configured to display a purchaser's trademark, logo, etc.

[0023] Turning now to FIGS. 3 and 4, the juxtaposition of the rear trim bezel 20 is readily discernible. In addition, the peripheral gap 24 (FIG. 9) that is defined between the rear trim plate 22 and the second or rear side 16 of the housing 12 can be seen. As illustrated, the peripheral flange 116 of the rear trim plate 22 is angled in a direction toward a peripheral edge 140 of the housing 12. Thus, the peripheral flange 116 of the rear trim plate 22 is not coplanar with the planar extent of the intermediate portion 114 of the rear trim plate 22. It is also contemplated that the rear trim plate 22 may include a curvilinear architecture. Regardless, it is generally contemplated that the peripheral flange 116 will extend toward and be angled toward the peripheral edge 140 of the housing 12. Nevertheless, it is also contemplated that the peripheral flange 116 could also extend linearly generally parallel with the planar extent of the electro-optic element 18.

[0024] With reference to FIGS. 5-7, the rear portion 102 of the rearview device 10 includes a generally curved design. An aesthetic channel 144 is disposed between the intermediate portion 114 and the peripheral flange 116 of the rear trim plate 22. In the illustrated embodiment, first and second spacing trusses 26 are located on each side of the rearview device 10. The first and second spacing trusses 26 are shown extending in a direction toward the plurality of rounded corners 130 of the housing 12. Each of the first and second spacing trusses 26 includes a base wall 131 from which the first and second lateral walls 30, 32 extend toward the rear trim bezel 20. In the illustrated embodiment, the first and second lateral walls 30, 32 of the spacing truss 26 terminate at the rear trim bezel 20. However, it is generally contemplated that the first and second lateral walls 30, 32 may extend past the rear trim bezel 20, or may terminate before reaching the rear trim bezel 20. In addition, the first and second lateral walls 30, 32 are set at angles relative to the linear extent of the rearview device 10. Stated differently, the first and second lateral walls 30, 32 are not parallel. Rather, the first and second lateral walls 30, 32 extend at an angle relative to one another, generally in the direction of the plurality of rounded corners 130 of the housing 12.

[0025] With reference now to FIGS. 3 and 7-9, the components of the rearview device 10 as set forth in FIGS. 5 and 6 are illustrated in an exploded view. The housing 12 is configured to receive a washer 150 that supports and receives fasteners that secure the device ball 100 to the rear side or second side 16 of the housing 12. The electro-optic

element 18 is received in the front recess 123 (FIG. 8) of the housing 12 and the badge 136 is secured to the first surface 42 (FIG. 9) of the electro-optic element 18. The badge 136 may be coupled with the housing 12 or the electro-optic element 18 via mechanical fasteners, adhesive, etc. In addition, the rear trim bezel 20 is generally illustrated, which is configured to engage the second side 16 of the housing 12. The rear trim bezel 20 extends around a periphery of the housing 12 on the second side 16 of the housing 12. However, the rear trim bezel 20 does not extend around the peripheral edge 140 of the housing 12. In addition, the spacing trusses 26 are operably coupled with the second side 16 of the housing 12, and include engagement flanges 156 protruding from an engagement side 158 of each of the first and second lateral walls 30, 32, which engage receiving slots 160 defined on the second side 16 of the housing 12. It is generally contemplated that the flanges 156 may engage via a snap-fit connection, for example.

[0026] With reference again to FIGS. 7 and 8, the rear trim plate 22 extends over a body 161 protruding from the housing 12. The body 161 generally defines a cavity 162 configured to house a printed circuit board 163. The body 161 includes a peripheral wall 164 that is generally parallel with a planar extent of the electro-optic element 18. The peripheral wall 164 extends outwardly from the body 161. However, the rear trim plate 22 extends primarily over a rear face 166 of the body 161. A rear applique 170 is configured to engage a rear portion of the housing 12. The rear applique 170 defines an inner opening 171 within which the rear trim plate 22 and the mount 92 (FIG. 3) extend to couple with a rear portion of the housing 12. Thus, the rear applique 170 extends around the mount 92 and the rear trim plate 22. In addition, left-hand and right-hand appliques 172, 174, are configured to engage recesses 173 of the housing 12 disposed on left and right sides of the mounting area 105 (FIG. 1) of the device ball 100, respectively. As with the badge 136, which may include a variety of different emblems, logos, trademarks, etc., the appliques 170, 172, 174 are generally configured to be interchangeable to accommodate the needs of a particular purchaser. In addition, the appliques may be decorative appliques that match the interior or trim of a vehicle.

[0027] With reference now to FIGS. 8 and 9, the peripheral gap 24 defined between the rear trim plate 22 and the second side 16 or rear side of the housing 12 is illustrated. The rear applique 170 extends generally from the rear trim bezel 20 all the way to the body 161 of the housing 12. In addition, the rear applique 170 is larger on the sides than on

the top and bottom. Further, it is generally understood that the peripheral wall 164 includes a bulbous rim 180 that extends about the periphery of the housing 12. The bulbous rim 180 is configured to conceal at least a portion of the periphery of the rear trim bezel 20, as well as the periphery of the electro-optic element 18. In the illustrated embodiment, the bulbous rim 180 generally abuts and conceals an outer wall 182 of the rear trim bezel 20. Further, the electro-optic element 18 is generally set in the front recess 123 such that the bulbous rim 180 protrudes slightly beyond the first surface 42 of the electro-optic element 18.

[0028] Turning again to FIG. 8, in the illustrated embodiment, it is noted that the intermediate portion 114 of the rear trim plate 22 is not coplanar with the peripheral flange 116. Further, the peripheral flange 116 may be constructed from a different material than the intermediate portion 114 and optionally include different reflective properties. In addition, the housing 12 supports the printed circuit board 163 illustrated as including a glare sensor 192 that receives light directed at the electro-optic element 18. The glare sensor 192 includes a light pipe 194 that conveys light directed at the electro-optic element 18 from the first surface 42 of the electro-optic element 18 to a rearward side 196 of the printed circuit board 163. Thus, a sleeker and slimmer profile from front to back can be obtained on the rearview device 10, as illustrated. In addition, the peripheral wall 164 includes a planar extent that is generally parallel with a planar extent of the electro-optic element 18. Accordingly, the printed circuit board 163 and other circuitry, as well as any other components that are made available for the rearview device 10, are all provided in the body 161 of the housing 12 and do not extend as far as the peripheral walls 164 of the rearview device 10. However, it is contemplated that in some embodiments, additional room may be gained between the electro-optic element 18 and the peripheral wall 164 of the housing 12.

[0029] The multi-piece construction, as set forth above, includes improved aesthetics that are configurable to provide multiple styling options. Various appliques can be changed to modify the appearance of the rearview device 10. In addition, the spacing trusses 26 are plated and can be removed to modify the appearance of the rearview device 10. Further, the rear trim bezel 20 can be modified to include different finishes, thus also modifying the appearance of the rearview device 10. The rear trim plate 22 gives the appearance of having a floating condition. In one example, the outer portion or

peripheral flange 116 of the rear trim plate 22 is clear, while the intermediate portion 114 is opaque. In another example, the peripheral flange 116 is opaque, while the intermediate portion 114 is clear. Variations on this configuration can be made to provide various aesthetics, depending on the preference of the consumer. Moreover, the rear trim plate 22 provides an aperture, as set forth above, that allows for the ambient light sensor 110, which is located in the body 161 of the housing 12, to receive light, thus providing data to the printed circuit board 163 related to the ambient light condition when the vehicle, and specifically the rearview device 10, are being used.

[0030] The electro-optic element 18 could also be an element such as a prism. One non-limiting example of an electro-optic element includes an electrochromic medium, which includes at least one solvent, at least one anodic material, and at least one cathodic material. Typically, both of the anodic and cathodic materials are electroactive and at least one of them is electrochromic. It will be understood that regardless of its ordinary meaning, the term "electroactive" will be defined herein as a material that undergoes a modification in its oxidation state upon exposure to a particular electrical potential difference. Additionally, it will be understood that the term "electrochromic" will be defined herein, regardless of its ordinary meaning, as a material that exhibits a change in its extinction coefficient at one or more wavelengths upon exposure to a particular electrical potential difference. Electrochromic components, as described herein, include materials whose color or opacity are affected by electric current, such that when an electrical current is applied to the material, the color or opacity change from a first phase to a second phase. The electrochromic component may be a single-layer, single-phase component, multi-layer component, or multi-phase component, as described in U.S. Patent Nos. 5,928,572 entitled "Electrochromic Layer And Devices Comprising Same," 5,998,617 entitled "Electrochromic Compounds," 6,020,987 entitled "Electrochromic Medium Capable Of Producing A Pre-selected Color," 6,037,471 entitled "Electrochromic Compounds," 6,141,137 entitled "Electrochromic Media For Producing A Pre-selected Color," 6,241,916 entitled "Electrochromic System," 6,193,912 entitled "Near Infrared-Absorbing Electrochromic Compounds And Devices Comprising Same," 6,249,369 entitled "Coupled Electrochromic Compounds With Photostable Dication Oxidation States," and 6,137,620 entitled "Electrochromic Media With Concentration Enhanced Stability, Process For The Preparation Thereof and Use In Electrochromic Devices"; U.S. Patent

No. 6,519,072, entitled "Electrochromic Device"; and International Patent Application Serial Nos. PCT/US98/05570 entitled "Electrochromic Polymeric Solid Films, Manufacturing Electrochromic Devices Using Such Solid Films, And Processes For Making Such Solid Films And Devices," PCT/EP98/03862 entitled "Electrochromic Polymer System," and PCT/US98/05570 entitled "Electrochromic Polymeric Solid Films, Manufacturing Electrochromic Devices Using Such Solid Films, And Processes For Making Such Solid Films And Devices," which are herein incorporated by reference in their entirety. The glass element may also be any other element having partially reflective, partially transmissive properties. To provide electric current to the glass element, electrical elements are provided on opposing sides of the element, to generate an electrical potential therebetween. Element clips, such as J-clips, are electrically engaged with each electrical element, and element wires extend from the J-clips to the main printed circuit board (PCB).

[0031] The present disclosure may be used with a rearview assembly such as that described in U.S. Patent Nos. 8,925,891; 8,814,373; 8,201,800; and 8,210,695; U.S. Patent Application Publication Nos. 2014/0063630 and 2012/0327234; and U.S. Provisional Patent Application Nos. 61/709,716; 61/707,676; and 61/704,869, which are hereby incorporated herein by reference in their entirety. Further, the present disclosure may be used with a rearview packaging assembly such as that described in U.S. Patent Nos. 8,885,240; 8,814,373; 8,646,924; 8,643,931; and 8,264,761; and U.S. Provisional Patent Application Nos. 61/707,625; and 61/590,259, which are hereby incorporated herein by reference in their entirety. Additionally, it is contemplated that the present disclosure can include a bezel such as that described in U.S. Patent Nos. 8,827,517; 8,210,695; and 8,201,800, which are hereby incorporated herein by reference in their entirety.

[0032] It will be appreciated that embodiments of the disclosure described herein may be comprised of one or more conventional processors and unique stored program instructions that control one or more processors to implement, in conjunction with certain non-processor circuits, some, most, or all of the functions of a display mirror assembly, as described herein. The non-processor circuits may include, but are not limited to signal drivers, clock circuits, power source circuits, and/or user input devices. As such, these functions may be interpreted as steps of a method used in using or constructing a classification system. Alternatively, some or all functions could be

implemented by a state machine that has no stored program instructions, or in one or more application specific integrated circuits (ASICs), in which each function or some combinations of certain of the functions are implemented as custom logic. Of course, a combination of the two approaches could be used. Thus, the methods and means for these functions have been described herein. Further, it is expected that one of ordinary skill, notwithstanding possibly significant effort and many design choices motivated by, for example, available time, current technology, and economic considerations, when guided by the concepts and principles disclosed herein will be readily capable of generating such software instructions and programs and ICs with minimal experimentation.

[0033] It will be understood by one having ordinary skill in the art that construction of the described disclosure and other components is not limited to any specific material. Other exemplary embodiments of the disclosure disclosed herein may be formed from a wide variety of materials, unless described otherwise herein.

[0034] For purposes of this disclosure, the term "coupled" (in all of its form, couple, coupling, coupled, etc.) generally means the joining of two components (electrical or mechanical) directly or indirectly to one another. Such joining may be stationary in nature or movable in nature. Such joining may be achieved with the two components (electrical or mechanical) and any additional intermediate members being integrally formed as a single unitary body with one another or with the two components. Such joining may be permanent in nature or may be removable or releasable in nature unless otherwise stated.

[0035] It is also important to note that the construction and arrangement of the elements of the disclosure as shown in the exemplary embodiments is illustrative only. Although only a few embodiments of the present innovations have been described in detail in this disclosure, those skilled in the art who review this disclosure will readily appreciate that many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter recited. For example, elements shown as integrally formed may be constructed of multiple parts or elements shown as multiple parts may be integrally formed, the operation of the

interfaces may be reversed or otherwise varied, the length or width of the structures and/or members or connector or other elements of the system may be varied, the nature or number of adjustment positions provided between the elements may be varied. It should be noted that the elements and/or assemblies of the system may be constructed from any of a wide variety of materials that provide sufficient strength or durability, in any of a wide variety of colors, textures, and combinations. Accordingly, all such modifications are intended to be included within the scope of the present innovations. Other substitutions, modifications, changes, and omissions may be made in the design, operating conditions, and arrangement of the desired and other exemplary embodiments without departing from the spirit of the present innovations.

[0036] It will be understood that any described processes or steps within described processes may be combined with other disclosed processes or steps to form structures within the scope of the present disclosure. The exemplary structures and processes disclosed herein are for illustrative purposes and are not to be construed as limiting.

[0037] It is also to be understood that variations and modifications can be made on the aforementioned structures and methods without departing from the concepts of the present disclosure, and further it is to be understood that such concepts are intended to be covered by the following claims unless these claims by their language expressly state otherwise.

What is claimed is:

1. A rearview device comprising:
 - a housing including a first side and a second side opposite the first side;
 - an electro-optic element operably coupled with the first side of the housing;
 - a rear trim bezel disposed on the second side of the housing;
 - a rear trim plate operably coupled with the second side of the housing;
 - a peripheral gap defined between the rear trim plate and the second side of the housing; and
 - a spacing truss disposed in the peripheral gap, the spacing truss including first and second lateral walls extending to the rear trim bezel.
2. The rearview device of claim 1, wherein the rear trim plate includes an intermediate portion and a peripheral flange.
3. The rearview device of claim 2, wherein the peripheral flange extends from the intermediate portion and is angled toward a peripheral edge of the housing.
4. The rearview device of any one of claims 1-3, wherein the housing includes a body defining a cavity configured to house a printed circuit board, wherein the body includes a peripheral wall that is generally co-planar with a planar extent of the electro-optic element.
5. The rearview device of claim 4, wherein the peripheral wall includes a bulbous rim.
6. The rearview device of any one of claims 4 and 5, wherein the printed circuit board includes a glare sensor that receives light directed at the electro-optic element.
7. The rearview device of claim 6, wherein the glare sensor includes a light pipe that conveys light directed at the electro-optic element to the rearward side of the printed circuit board.

8. The rearview device of any one of claims 1-7, wherein the rear trim bezel is visible only when viewing the second side of the housing.
9. A rearview device comprising:
 - a housing including a front side and a rear side opposite the front side;
 - an electro-optic element operably coupled with the housing and engaged with the front side;
 - a trim bezel disposed on the rear side of the housing, behind the electro-optic element;
 - a rear trim plate operably coupled with the rear side of the housing; and
 - a peripheral gap defined between the rear trim plate and the rear side of the housing.
10. The rearview device of claim 9, further comprising:
 - a decorative applique disposed on the rear side of the housing, the decorative applique extending around the rear trim plate.
11. The rearview device of any one of claims 9 and 10, further comprising:
 - first and second trusses disposed on the rear side of the housing, the first and second trusses including a base wall and a plurality of outwardly extending lateral walls.
12. The rearview device of claim 11, wherein the plurality of outwardly extending lateral walls extend to the trim bezel.
13. The rearview device of any one of claims 10-12, wherein the housing includes a body defining a cavity configured to house a printed circuit board, wherein the body includes a peripheral wall that is generally coplanar with a planar extent of the electro-optic element.
14. The rearview device of claim 13, wherein the peripheral wall includes a bulbous rim.

15. The rearview device of any one of claims 13 and 14, wherein the printed circuit board includes a forward side and a rearward side, the printed circuit board including a glare sensor light pipe that conveys light directed at the electro-optic element to the rearward side of the printed circuit board.

16. A rearview device comprising:

a housing including a first side and a second side opposite the first side;

an electro-optic element operably coupled with the housing and engaged with the first side; and

a printed circuit board disposed inside the housing and including a forward side and a rearward side, the printed circuit board including a light pipe that conveys light directed at the electro-optic element to the rearward side of the printed circuit board.

17. The rearview device of claim 16, wherein the housing includes a body defining a cavity configured to house the printed circuit board, wherein the body includes a peripheral wall that is generally co-planar with a planar extent of the electro-optic element.

18. The rearview device of claim 17, further comprising:

a rear trim bezel disposed on the second side of the housing;

a rear trim plate operably coupled with the second side of the housing;

a peripheral gap defined between the rear trim plate and the second side of the housing; and

a spacing truss disposed in the peripheral gap, the spacing truss including first and second lateral walls extending to the rear trim bezel.

19. The rearview device of any one of claims 16-18, wherein the printed circuit board includes a glare sensor that receives light directed at the electro-optic element.

20. The rearview device of claim 19, further comprising:

a glare sensor on the rearward side of the printed circuit board that receives light from the light pipe.

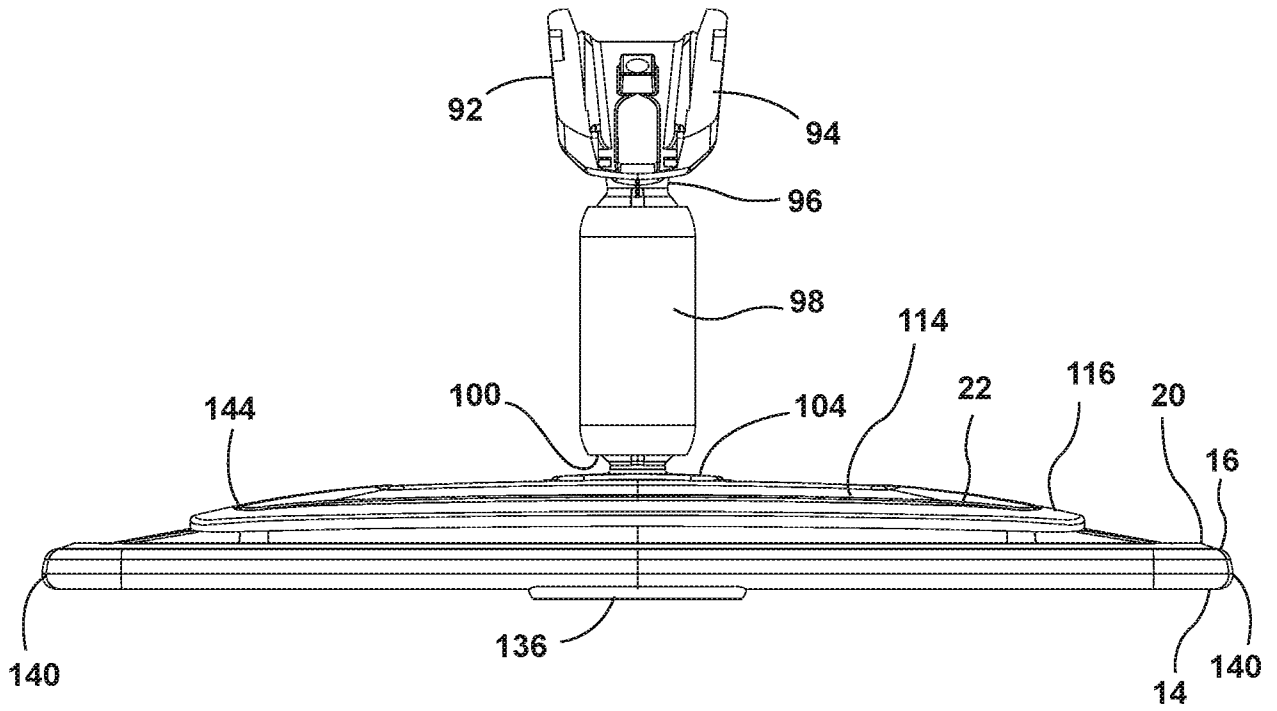


FIG. 3

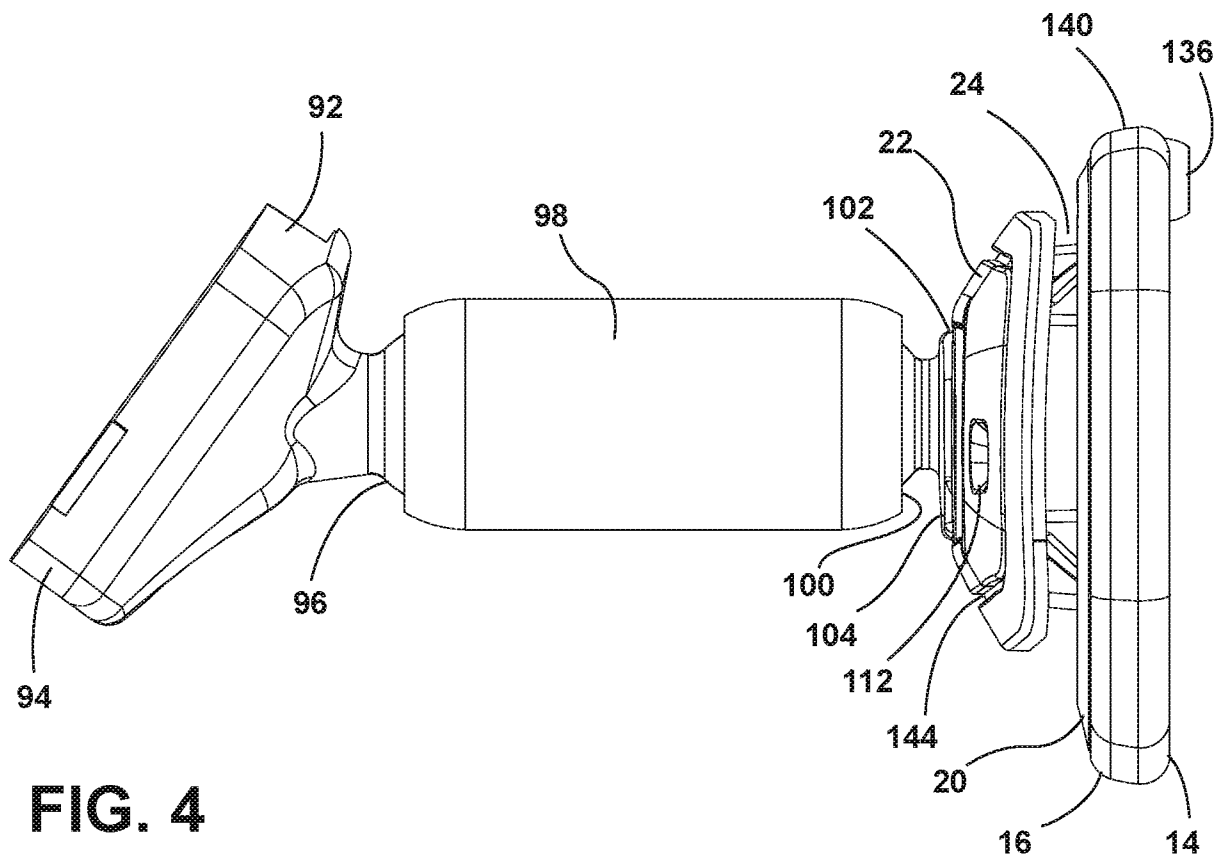


FIG. 4

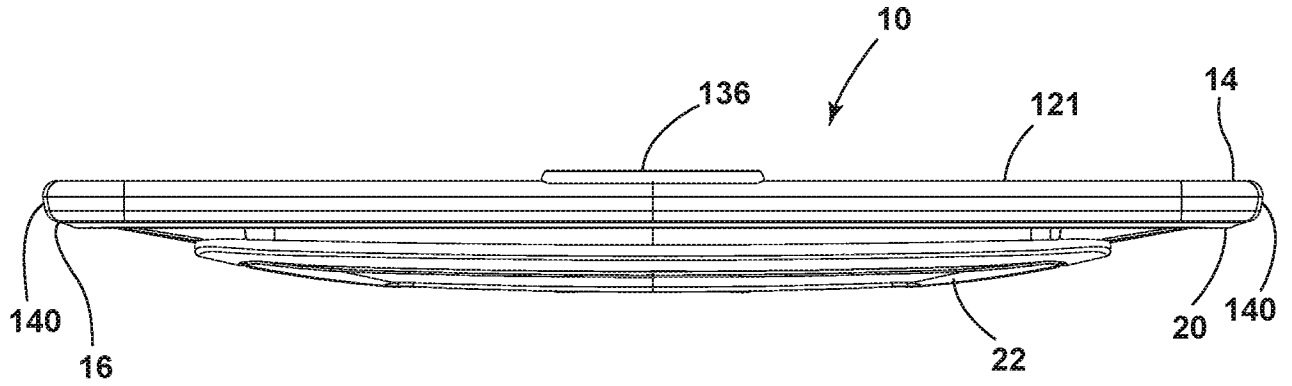


FIG. 5

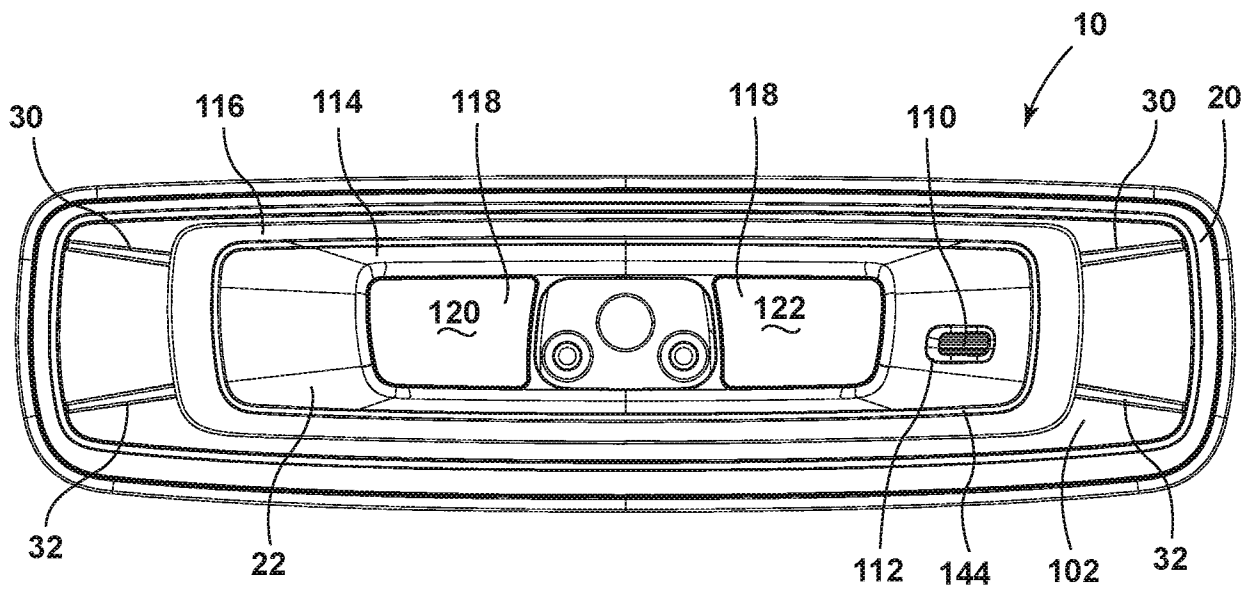


FIG. 6

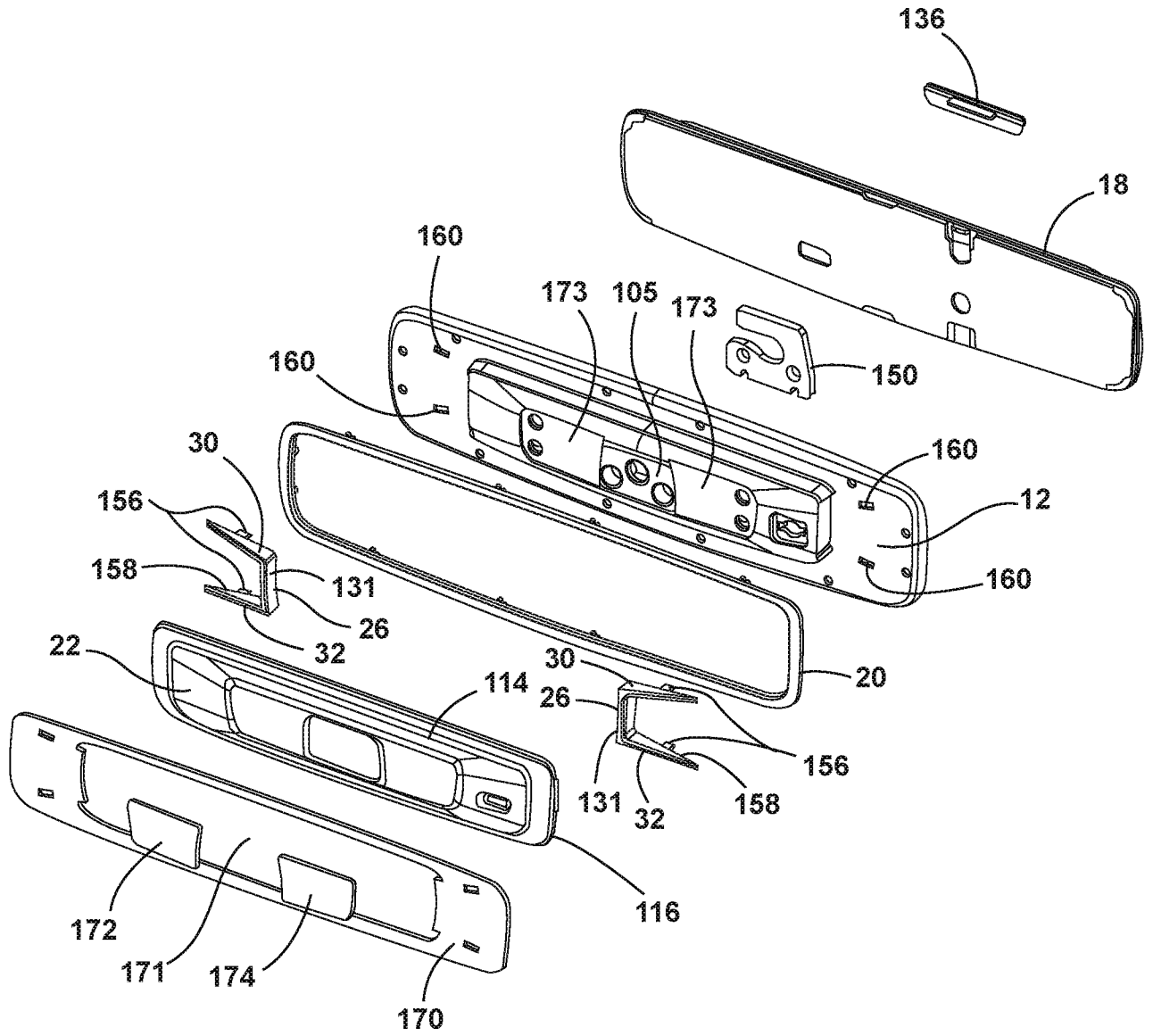


FIG. 7

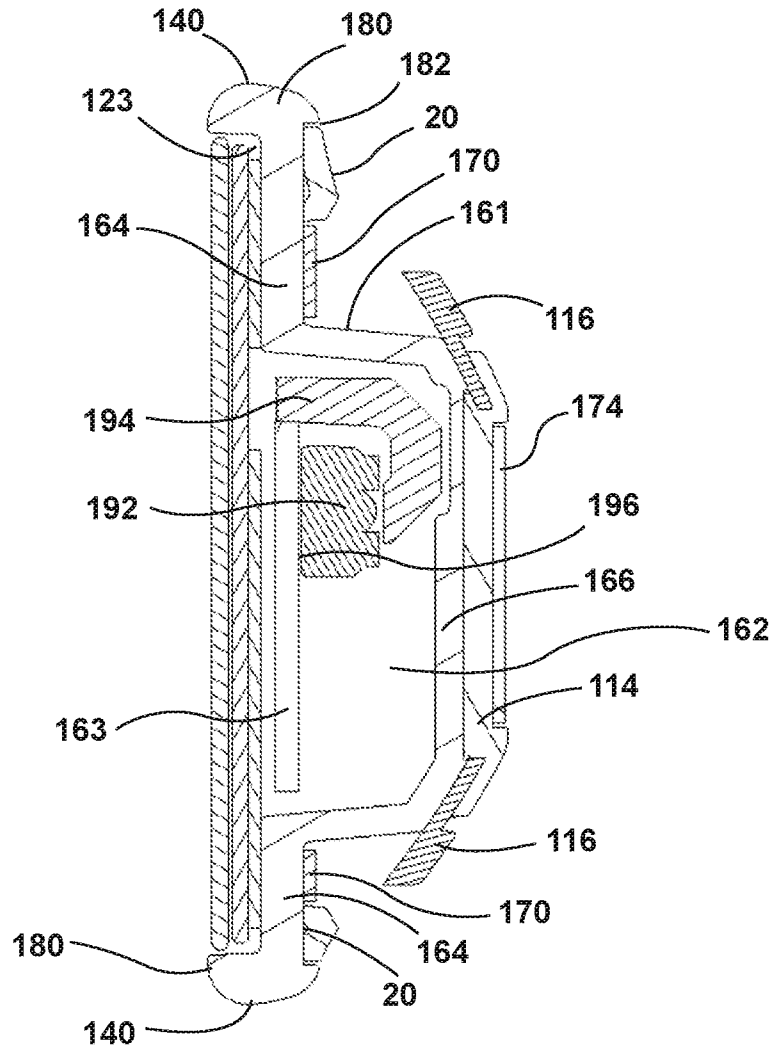


FIG. 8

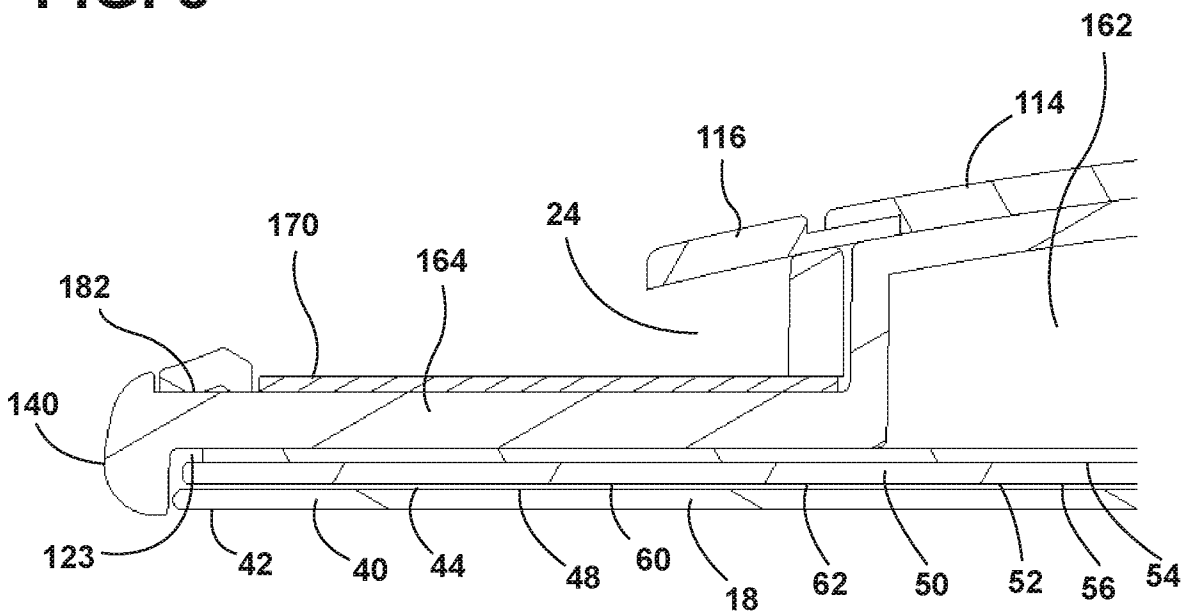


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2016/059499

A. CLASSIFICATION OF SUBJECT MATTER		<p style="text-align: center;">B60R 1/08 (2006.01) B60R 1/12 (2006.01)</p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>	
B. FIELDS SEARCHED			
Minimum documentation searched (classification system followed by classification symbols)			
B32B 17/00-17/10, B60R 1/00-1/12, 21/00-21/08, B60K 35/00, G02B 27/00-27/01, 5/00, 5/08, G02F 1/00-1/15, G06F 3/00-3/01, H04N 7/00-7/18			
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)			
RUPAT, Espacenet, USPTO DB, PAJ, EAPATIS, Patentscope, KIPRIS, K-PION			
C. DOCUMENTS CONSIDERED TO BE RELEVANT			
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	
X A	US 2007/0171663 A1 (DONNELLY CORPORATION) 26.07.2007, paragraphs [0013] - [0019], fig. 1-6	16-17, 19-20 1-5, 9-12, 18	
A	US 5434407 A (GENTEX CORPORATION) 18.07.1995, col. 4, line 25 - col. 8, line 50, fig. 1-5	1-5, 9-12, 16-20	
A	US 2012/0182242 A1 (DONNELLY CORPORATION) 19.07.2012, paragraphs [0047] - [0066], fig. 1-22	1-5, 9-12, 16-20	
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.			
* Special categories of cited documents:		"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
"A"	document defining the general state of the art which is not considered to be of particular relevance		
"E"	earlier document but published on or after the international filing date		
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)		
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		
Date of the actual completion of the international search		Date of mailing of the international search report	
19 December 2016 (19.12.2016)		06 March 2017 (06.03.2017)	
Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37		Authorized officer N. Bedretdinov Telephone No. (495)531-64-81	

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.: 6-8, 13-15
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.