CLAIMS

What is claimed is:

1. A light-based touch-sensitive surface, comprising:

a housing;

a surface attached to said housing for receiving touch input;

a plurality of light sources in said housing for emitting light that crosses said surface;

a plurality of light receivers in said housing for detecting the light emitted by said light sources;

a curved lens adjacent to said surface through which the light emitted by said light sources passes, comprising first and second curved panels having substantially similar curvatures, wherein the light is refracted as it enters said first curved panel and is refracted again as it exits said second curved panel, the refraction upon exit being the inverse of the refraction upon entry, and wherein one of said panels is curved in a horizontal plane parallel to said surface and forms a curved rim for said surface; and

a calculating unit in said housing, connected to said light receivers, for calculating a touch location based on an absence of light expected to be received by said receivers.

2. The touch-sensitive surface of claim 1, wherein said surface is embedded in a vehicle dashboard.

3. The touch-sensitive surface of claim 1, wherein the light emitted by said light sources passes through said curved lens prior to crossing said surface, and wherein said calculating unit calculates a touch location based on where the light emitted by said light sources exits said curved lens.

4. The touch-sensitive surface of claim 1, wherein the light emitted by said light sources crosses said surface prior to passing through said curved lens, and wherein said calculating unit calculates a touch location based on where the light emitted by said light sources enters said curved lens.

5. The touch-sensitive surface of claim 1, further comprising a collimating lens situated between said emitters and said curved lens.

6. The touch-sensitive surface of claim 1, further comprising a collimating lens situated between said receivers and said curved lens.

7. The touch-sensitive surface of claim 1, wherein said curved lens comprises an interior reflective panel.

8. The touch-sensitive surface of claim 7, wherein the other panel is curved in a vertical plane incident to the horizontal plane, and wherein said interior reflective panel reflects the light between the first and second refractions.

9. The touch-sensitive surface of claim 1, wherein said curved lens comprises two internal reflective panels.

10. The touch-sensitive surface of claim 1, wherein both of said panels are curved in the horizontal plane parallel to said surface.

11. A light-based touch-sensitive surface, comprising:

a housing;

a surface attached to said housing for receiving touch input;

a plurality of light sources in said housing for emitting light that crosses said surface;

a plurality of light receivers in said housing for detecting the light emitted by said light sources;

a lens structure adjacent to said surface through which the light emitted by said light sources passes, comprising:

a vertical lens face; and

an exterior sloping lens panel joined to said vertical lens face at an apex of the sloping lens panel so as to form an inner angular air cavity in the lens structure; and

a calculating unit in said housing, connected to said light receivers, for calculating a touch location based on the absence of light expected to be received by said receivers.

12. The touch-sensitive surface of claim 11, wherein said exterior sloping lens panel is flat.

13. The touch-sensitive surface of claim 11, wherein said exterior sloping lens panel is convex-shaped.

14. The touch-sensitive surface of claim 11, wherein said exterior sloping lens panel is curved in a horizontal plane parallel to said surface.

15. A lens structure for use with a light-based touch-sensitive apparatus, comprising:

a vertical lens face; and

an exterior sloping lens panel joined to said vertical lens face at an apex of the sloping lens panel so as to form an inner angular air cavity in the lens structure.

16. The lens of claim 15, wherein said exterior sloping lens panel is flat.

17. The lens of claim 15, wherein said exterior sloping lens panel is convex-shaped.

18. The touch-sensitive surface of claim 15, wherein said exterior sloping lens panel is curved in a horizontal plane incident to said vertical lens face.

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1. A light-based touch-sensitive surface, comprising:

a housing;

a surface attached to said housing for receiving touch input;

a plurality of light sources in said housing for emitting light that crosses said surface;

a plurality of light receivers in said housing for detecting the light emitted by said light sources;

a curved lens adjacent to said surface through which the light emitted by said light sources passes, comprising first and second curved panels having substantially similar curvatures, wherein the light is refracted as it enters said first curved panel and is refracted again as it exits said second curved panel, the refraction upon exit being the inverse of the refraction upon entry, and wherein one of said panels is curved in a horizontal plane parallel to said surface and forms a curved rim for said surface; and

a calculating unit in said housing, connected to said light receivers, for calculating a touch location based on an absence of light expected to be received by said receivers.

2. The touch-sensitive surface of claim 1, wherein said surface is embedded in a vehicle dashboard.

3. The touch-sensitive surface of claim 1, wherein the light emitted by said light sources passes through said curved lens prior to crossing said surface, and wherein said calculating unit calculates a touch location based on where the light emitted by said light sources exits said curved lens.

4. The touch-sensitive surface of claim 1, wherein the light emitted by said light sources crosses said surface prior to passing through said curved lens, and wherein said calculating unit calculates a touch location based on where the light emitted by said light sources enters said curved lens.

5. The touch-sensitive surface of claim 1, further comprising a collimating lens situated between said emitters and said curved lens.

6. The touch-sensitive surface of claim 1, further comprising a collimating lens situated between said receivers and said curved lens.

7. The touch-sensitive surface of claim 1, wherein said curved lens comprises an interior reflective panel.

8. The touch-sensitive surface of claim 7, wherein the other curved panel is curved in a vertical plane incident to the horizontal plane, and wherein said interior reflective panel reflects the light between its refraction upon entry and its refraction upon exit.

9. The touch-sensitive surface of claim 1, wherein said curved lens comprises two internal reflective panels.

10. The touch-sensitive surface of claim 1, wherein both of said panels are curved in the horizontal plane parallel to said surface.

11. A light-based touch-sensitive surface, comprising:

a housing;

a surface attached to said housing for receiving touch input;

a plurality of light sources in said housing for emitting light that crosses said surface;

a plurality of light receivers in said housing for detecting the light emitted by said light sources;

a lens structure adjacent to said surface through which the light emitted by said light sources passes, comprising:

a vertical lens face; and

an exterior sloping lens panel joined to said vertical lens face at an apex of the sloping lens panel so as to form an inner angular air cavity in the lens structure; and

a calculating unit in said housing, connected to said light receivers, for calculating a touch location based on the absence of light expected to be received by said receivers.

12. The touch-sensitive surface of claim 11, wherein said exterior sloping lens panel is flat.

13. The touch-sensitive surface of claim 11, wherein said exterior sloping lens panel is convex-shaped.

14. The touch-sensitive surface of claim 11, wherein said exterior sloping lens panel is curved in a horizontal plane parallel to said surface.

15. A lens structure for use with a light-based touch-sensitive apparatus, comprising:

a vertical lens face; and

an exterior sloping lens panel joined to said vertical lens face at an apex of the sloping lens panel so as to form an inner angular air cavity in the lens structure.

16. The lens structure of claim 15, wherein said exterior sloping lens panel is flat.

17. The lens structure of claim 15, wherein said exterior sloping lens panel is convex-shaped.

18. The lens structure of claim 15, wherein said exterior sloping lens panel is curved in a horizontal plane incident to said vertical lens face.