Claims

1. A waveguide display element comprising:

- a waveguide comprising two opposing main surfaces,
- a first diffractive optical element arranged at a first location of the waveguide,
- a second diffractive optical element arranged at a second location of the waveguide, and
- a plurality of curved reflector surfaces including at least one reflector surface extending between said main surfaces and adapted to reflect light rays propagating within the waveguide, wherein the at least one reflector surface is adapted to redirect light rays from the first diffractive optical element to the second diffractive optical element, wherein:
- the at least one reflector surface is curved when inspected in the plane of said main surfaces, and
- ~~there are a~~the plurality of ~~such~~ curved reflector surfaces are of the same or different kinds and arranged between the same or different first and second diffractive optical elements.

2. The element according to claim 1, wherein the at least one reflector surface is perpendicular to said main surfaces.

3. The element according to claim 2, wherein the first and second diffractive optical elements comprise grating areas.

~~3. The element according to claim 1, wherein the reflector surface is tilted with respect to the normal direction of said main surfaces, typically by 25 degrees at maximum.~~

~~4. The element according to claim 1, wherein the reflector surface is curved when inspected in a plane perpendicular to said main surfaces.~~

~~5.~~4. The element according to ~~any of the preceding claims~~claim 2, wherein:

- the waveguide comprises at least one outer edge surface extending between said main surfaces, and
- the at least one reflector surface is located at said outer edge surface.

~~6.~~5. The element according to ~~any of claims 1-4~~claim 2, wherein:

– the waveguide comprises at least one outer edge surface extending between said main surfaces, and

– the at least one reflector surface is located within the waveguide at a distance from said outer edge surface.

6. The element according to claim 1, wherein the at least one reflector surface is tilted with respect to the normal direction of said main surfaces, typically by 25 degrees at maximum.

7. The element according to claim 1, wherein the at least one reflector surface is curved when inspected in a plane perpendicular to said main surfaces.

8. The element according to claim 1, wherein:

the waveguide comprises at least one outer edge surface extending between said main surfaces, and

the at least one reflector surface is located at said outer edge surface.

9. The element according to claim 1, wherein:

the waveguide comprises at least one outer edge surface extending between said main surfaces, and

the at least one reflector surface is located within the waveguide at a distance from said outer edge surface.

~~7.~~10. The element according to claim ~~6~~9, wherein:

– the waveguide comprises at least one void having an inner edge surface extending between said main surfaces, and

– the at least one reflector surface is located at said inner edge surface at a distance from said outer edge surface.

~~8.~~11. The element according to ~~any of the preceding claims~~claim 1, wherein the at least one reflector surface comprises a grating capable of reflective diffraction of said light rays.

~~9.~~12. The element according to ~~any of the preceding claims~~claim 1, wherein the at least one reflector surface comprises a reflective coating, such as a metal coating.

~~10.~~13. The element according to ~~any of the preceding claims~~claim 1, wherein the at least one reflector surface comprises a thin-film stack.

~~11. The element according to any of the preceding claims, wherein the first and second diffractive optical elements comprise grating areas.~~

~~12.~~14. The element according to ~~any of the preceding claims~~claim 1, wherein:

– the first diffractive optical element comprises an exit pupil expander grating area, and
– the second diffractive optical element comprises an out-coupling grating area.

~~13.~~15. The element according to ~~any of the preceding claims~~claim 1, wherein:

– the first diffractive optical element comprises an in-coupling grating area, and
– the second diffractive optical element comprises an out-coupling grating area.

~~14.~~16. The element according to ~~any of the preceding claims~~claim 1, wherein:

– the first diffractive optical element comprises a light source element integral with the waveguide, and
– the second diffractive optical element comprises a display panel integral with the waveguide.

~~15.~~17. The element according to ~~any of the preceding claims~~claim 1, wherein:

– the first diffractive optical element comprises an attached or integrated image source component, and
– the second diffractive optical element comprises a diffractive grating area, such an exit pupil expander grating area or an out-coupling grating area.

~~16.~~18. The element according to ~~any of the preceding claims~~claim 1, wherein at least one of the first and second diffractive optical elements includes the at least one ~~is a~~ reflective surface~~, in particular a reflector surface as referred to in any of the preceding claims~~.

~~17.~~19. The element according to ~~any of the preceding claims~~ claim 1, wherein the at least one reflector surface is adapted to carry out a field-of-view compression or

decompression optical function for a set of light rays representing an image coupled into the waveguide.

~~18.~~20. A personal see-through display device, such as a head-mounted display device or head-up display device, comprising a waveguide display element according to ~~any of the preceding claims~~claim 1.