Claims

[Claim 1] A method of forming a waveguide combiner, comprising:

transferring a respective input coupling grating having first device structures to a waveguide substrate from a first donor substrate having a plurality of input coupling gratings; and

transferring a respective output coupling grating having second device structures to the waveguide substrate from a second donor substrate having a plurality of output coupling gratings.

[Claim 2] The method of claim 1, further comprising disposing a coating layer over the input coupling grating.

[Claim 3] The method of claim 1, wherein transferring the input coupling grating from the first donor substrate to the waveguide substrate comprises transferring the input coupling grating using a transfer substrate, wherein the transfer substrate comprises an adhesive layer.

[Claim 4] The method of claim 1, further:

disposing a respective intermediate grating comprising a third device structure to the waveguide substrate from a third donor substrate having a plurality of intermediate gratings; and

transferring the respective intermediate grating from the third donor substrate to the waveguide substrate.

[Claim 5] A method of forming a waveguide combiner, comprising:

disposing a first coating layer over a first donor substrate;

disposing an input coupling grating having first device structures over the first coating layer;

transferring the input coupling grating having the first device structures to a waveguide substrate, wherein transferring the input coupling grating comprises inverting the first donor substrate and disposing the input coupling grating over the waveguide substrate;

disposing a second coating layer over a second donor substrate;

disposing an output coupling grating having second device structures over the second coating layer; and

transferring the output coupling grating having the second device structures to the waveguide substrate, wherein transferring the output coupling grating comprises inverting the second donor substrate and disposing the output coupling grating over the waveguide substrate.

[Claim 6] The method of claim 5, wherein transferring the input coupling grating to the waveguide substrate further comprises disposing an adhesive layer between the input coupling grating and the waveguide substrate.

[Claim 7] The method of claim 5, wherein transferring the input coupling grating to the waveguide substrate further comprises performing a treatment process on a surface of the waveguide substrate.

[Claim 8] The method of claim 5, further comprising disposing an encapsulation layer over the first coating layer.

[Claim 9] The method of claim 5, wherein transferring the output coupling grating to the waveguide substrate further comprises disposing an adhesive layer between the output coupling grating and the waveguide substrate.

[Claim 10] The method of claim 5, further comprising:

disposing a third coating layer over a third donor substrate;

disposing an intermediate grating having third device structures over the third coating layer; and

transferring the intermediate grating having the third device structures to the waveguide substrate, wherein transferring the intermediate grating comprises inverting the third donor substrate and disposing the intermediate grating over the waveguide substrate.

[Claim 11] The method of claim 10, wherein transferring the intermediate grating to the waveguide substrate further comprises performing a treatment process on a surface of the waveguide substrate.

[Claim 12] The method of claim 10, wherein transferring the intermediate grating to the waveguide substrate further comprises disposing an adhesive layer between the intermediate grating and the waveguide substrate.

[Claim 13] A waveguide combiner, comprising:

a substrate; and

an input coupling grating disposed over the substrate, the input coupling grating comprising:

a first device structure; and

a first coating layer disposed over the first device structure;

an output coupling grating disposed over the substrate, the output coupling grating comprising:

a second device structure; and

a second coating layer disposed over the second device structure; and

a global encapsulant disposed over the input coupling grating and the output coupling grating.

[Claim 14] The waveguide combiner of claim 13, further comprising an intermediate grating disposed over the substrate, the intermediate grating comprising:

a third device structure; and

a third coating layer disposed over the third device structure.

[Claim 15] The waveguide combiner of claim 13, wherein the first coating layer is disposed between the first device structure and the substrate.