element' final dimension are set by cutting step (d), grinding and polishing, to create the desired substrates 172 (step e)).

In all the embodiments illustrated in Figs. 6a-6e to Figs. 8a-8f, the number of plates that can be stacked is restricted by the number of reflecting surfaces in the final element. In Figs. 6a-6e, the number of the stacked plates is n+1, while in Figs. 7a-7e to Figs. 8a-8f it is n+2, wherein n is the number of the reflecting surfaces in the final element. This restriction in the number of the stacked plates limits the number of elements produced from a single stack. Usually, a conventional slicing device, typically a wire saw machine, can accommodate a much larger stack than the achievable size due to this limitation. As a result, the total yield of the manufacturing methods illustrated in Figs. 6a-6e to Figs. 8a-8f, is substantially restricted.

To improve the yield of the manufacturing method, it is required to arrange the plates' stack in a periodic unlimited structure. That is to say, the structure should not be limited by the number of reflecting surfaces in the substrate, but instead determined by the slicing device's overall capacity. The structure of the stack should typically, also be periodic to enable a uniform arrangement of the slicing device's wires.

Figs. 9a-9g illustrate an improved method for manufacturing the main transparent substrates 64. As shown in a side view of the x-z plane, a plurality of transparent flat plates 174, having at least two edges 101 and two major parallel surfaces 102, and coated with the appropriate optical coatings step (a) (if required) are cemented together using the appropriate optical adhesives so as to form a stacked form 175 having two main flat sides 105R, 105L (step (b)). The stack 175 can contain any number of plates 174 according to the capacity of the slicing device. Optionally, two prisms 176a and 176b can be cemented to the lower and upper main surfaces 104 of stack 175 to simplify the stack's positioning inside the slicing device. Several segments 178 (hatched lines step (c)) are then sliced off the stacked form. A single slice (dotted lines) containing the internal structure of the substrate 64 (Figs. 5A-5C) can be cut from each plate 174 (step (d)). The substrates' final dimensions are set by cutting off at 180 (step (e)), grinding and polishing, to form the desired lateral dimensions of the substrate 182 (step (f)). As shown in a top view of the x-y plane, several elements 183 can be cut-off from each slice 179 (step (g)). The dashed lines denote the cutting outlines, while the dotted-dashed lines denote the intersections of the slanted coupling-in surface 65 and coupling-out surface 67 with the major surfaces 70 and 72 of the substrate 64. In the specific example illustrated here, eight

CLAIMS:

1. A method for manufacturing an optical device having a light wave transmitting substrate with at least two major surfaces, edges and an output coupling-out reflecting element carried by the substrate, wherein the major surfaces are parallel to each other and not parallel to the coupling-out reflecting element, forming a substrate allowing light-waves to traverse the substrate between the two major surfaces, the method comprising:

a. attaching to each other a plurality of flat plates of a selected thickness, each ~~having~~ including ~~at least~~ two parallel main surfaces and two lateral edges arranged in ~~an unlimited~~ a first periodic stack; ~~having at least two surfaces parallel to the main surfaces of the plates and edges;~~

b. slicing the stack to form a plurality of slices defining slicing lines, ~~wherein~~ the stack ~~is~~ being oriented such that for the majority of the stacked plates, the slicing lines cross at least two lateral edges of the plate;

c. grinding or polishing the slice to form a substate with two major surfaces, and ~~a~~ the coupling-out reflecting element, ~~wherein the major surfaces are parallel to each other and not parallel to the coupling-out reflecting element,~~ and

d. cutting the substrate to final dimensions.

2. The method as claimed in claim 1, wherein the coupling-out element comprises ~~an array of~~ at least one reflecting surface~~. slanted at a first angle in relation to the major surfaces.~~

3. The method as claimed in claim 2, wherein the stack is sliced in a slicing device and the number of the plates is accommodated in the slicing device. ~~in the stack is not limited by the number of the reflecting surfaces in the substrate~~.

4. The method as claimed in claim 2, wherein the number of plates in the stack is substantially larger than the number of the reflecting surfaces in the substrate.

5. The method as claimed in claim 1, wherein at least a two-dimensional array of at least four substrates is cut-off from a single slice.

6. The method as claimed in claim 2, further comprising at least one prism having at least a first surface and a second surface, wherein the first surface is cemented to an edge of the first stack and the second surface is slanted at a second angle in relation to the first surface, the second angle being similar to the first angle.

7. The method as claimed in claim 6, wherein the second surface is slanted at a second angle in relation to the first surface, the second angle is similar to the first angle.

8. The method as claimed in claim 2, further comprising manufacturing a redirecting element having two major surfaces and a plurality of partially reflecting surfaces that are parallel to each other and not parallel to the major surfaces, for redirecting coupled-out light waves from the substrate into a viewer's eye:

e. attaching to each other a plurality of flat plates having two sides arranged in ~~an unbounded~~ a second periodic stack having at least two edges;

f. ~~slicing~~ cutting the stack to form a slice;

g. grinding or polishing the slice to form a redirecting element. ~~with two major surfaces, and a plurality of partially reflecting surfaces that are parallel to each other and not parallel to the major surfaces~~;

h. cutting the redirecting element to the final dimensions, and

i. cementing the redirecting element to one of the major surfaces of the substrate.

9. The method as claimed in claim 8, wherein at least part of the plates is not coated and at least another part of the plates is double-sided coated by a partially reflecting coating, the uncoated and the double-sided coated plates are arranged in an interlaced arrangement in the stack, forming an interface plane between two adjacent plates.

10. The method as claimed in claim 8, wherein the uncoated and the double-sided coated plates are arranged in an interlaced arrangement in the stack, forming an interface plane between two adjacent plates.

11. The method as claimed in claim 10, wherein each interface plane contains a solely partially reflecting surface.

12. The method as claimed in claim 8, wherein the redirecting element comprises an inactive section, and an active section containing a plurality of partially reflecting surfaces that redirect the coupled-out light waves into the viewer's eye, the active section is substantially larger than the projection of the coupling-out reflecting element on the major surfaces of the substrate.

13. The method as claimed in claim 12, wherein the inactive and the active sections are cemented to a major surface of the substrate using two different optical adhesives.

14. The method as claimed in claim 8, wherein at least part of the coupled light waves is redirected into the viewer's eye without being reflected by the coupling-out element.

15. The method as claimed in claim 8, wherein a plurality of identical second stacks are cemented together in a staggered arrangement so as to form an inclusive stack.

16. The method as claimed in claim 1, further comprising a coupling-in reflecting surface embedded inside the substrate, slanted at a third angle in relation to the major surfaces, the third angle is substantially similar to the first angle.

17. The method as claimed in claim 1, wherein at least two edges of the stacked plates are aligned together to form at least two main flat sides of the stack, and the stack is oriented such that the slicing lines pass through the stack between the two main flat sides.

18. The method as claimed in claim 17, wherein the stack is oriented such that the slicing lines pass through the stack between the two main flat sides.

19. The method as claimed in claim 1, wherein two adjacent slicing lines are spaced apart at a constant distance and are proportional to the thickness of the plates.

20. The method as claimed in claim 1, wherein the slicing lines cross the plate edges substantially at the same locations for all the stacked plates.