[006] The present invention seeks to provide high-power searchlights for marine lighting, search-rescue operation, safety beacon/signal or as a piracy deterrent tool.

[007] In one embodiment, the present invention provides a marine searchlight using two or more laser diodes as light excitation sources. Preferably, the searchlight output is a substantially white light beam or beams. Preferably, characteristics of the searchlight output are also adjustable. These marine searchlights are defined in claims 1-10.

[008] In another embodiment, the present invention provides a method for operating a marine searchlight. Steps for operating these searchlights are defined in claims 11-15.

Brief Description of the Drawings

[009] This invention will be described by way of non-limiting embodiments of the present invention, with reference to the accompanying drawings, in which:

[0010] FIGs. 1A-1B illustrate a searchlight according to a first embodiment of the present invention;

[0011] FIG. 2 illustrates a searchlight according to a second embodiment of the present invention;

[0012] FIG. 3 illustrates a searchlight according to a third embodiment of the present invention; and

[0013] FIG. 4 illustrates a searchlight according to a fourth embodiment of the present invention.

Detailed Description

[0014] One or more specific and alternative embodiments of the present invention will now be described with reference to the attached drawings. It shall be apparent to one skilled in

CLAIMS:

1. A marine searchlight apparatus comprising:

two or more laser diodes, which are operable to emit two or more laser beams of predetermined wavelengths;

a transparent phosphor member comprising phosphor activators to up-convert each of the predetermined laser wavelengths and the up-converted emissions are combined to produce a substantially white light output, with the phosphor activators being embedded in quartz; and

a collimating means to project the white light output into a searchlight of a predetermined divergence, shape and illuminating distance;

wherein the laser diodes, the transparent phosphor member and the collimating means are arranged inside a water-tight enclosure and the searchlight is directed through a front face of the water-tight enclosure; and

wherein one of the two or more laser diodes is operable to be Q-switched to produce an ultra-violet (UV) light component in a characteristic of the searchlight.

2. The marine searchlight apparatus according to claim 1, wherein the two or more laser diodes are optically aligned in axes with the transparent phosphor member.

3. The marine searchlight apparatus according to claim 1, wherein the two or more laser diodes are disposed on axes offset from an axis of the white light output and axes of the laser diodes and the white light output are connected by an associated mirror.

4. The marine searchlight apparatus according to any preceding claim, further comprises a reflector and the phosphor member is located near a focal centre of the reflector.

5. The marine searchlight apparatus according to claim 4, wherein the reflector is parabolic in shape.

6. The marine searchlight apparatus according to claim 3 or 4, further comprises a reflective support disposed on a rear surface of the transparent phosphor member to maximise reflection of the white light output.

7. The marine searchlight apparatus according to any one of the preceding claims, wherein a front and/or back surfaces of the transparent phosphor member is/are deposited with narrow-band anti-reflection coatings to minimize reflection losses of the laser beams.

8. The marine searchlight apparatus according to any one of the preceding claims, wherein the two or more laser diodes are operational as a gang, and two or more gangs of laser diodes are provided.

9. The marine searchlight apparatus according to claim 9, wherein a gang or gangs of the laser diodes is/are selectively turned on for modular control of the searchlight.

10. The marine searchlight apparatus according to any one of the preceding claims, further comprising a measuring laser diode, a half-mirror and a photodetector, wherein the measuring laser diode is operable to produce a distance sensing beam and the half-mirror is orientated to direct a reflected distance sensing beam to the photodetector.

11. A method of operating a marine searchlight according to claims 1-10, the method comprising:

exciting a phosphor member with two or more gangs of laser beams from laser diodes so that emissions from the phosphor member additively produce an approximate white light output;

collimating and shaping the white light output to produce a searchlight with a predetermined divergence and a predetermined lighting distance; and

turning on one or more gangs of the laser diodes, varying an excitation frequency of the one or more gangs of the laser diodes to control power of the searchlight and the lighting distance, and varying the excitation frequency of the one or more gangs of the laser diodes to produce an ultra-violet (UV) light component into a characteristic of the searchlight.

12. The method according to claim 11, wherein adding the UV light component comprises Q-switching one or more of the laser diodes or the one or more gangs of the laser diodes.

13. The method according to claim 11 or 12, further turning on the searchlight at a flashing speed to function as a beacon or a signal light.

14. The method according to claim 11 or 12, wherein the searchlight is turned on to high power to function as a light-blinding tool to deter pirates/intruders from coming on-board.

15. The method according to claim 11 or 12, wherein the searchlight is turned on to low power to function as a floodlight.