OBJECTIVE OF THE INVENTION

An object of the present invention is to provide a device for signature adaptation that manages thermal signature adaptation and that is suitable for implementation in vehicles/crafts, such as marine crafts.

An additional object of the present invention is to provide a device for signature thermal signature adaptation that enables achieving of active thermal camouflage with desired thermal structure

An additional object of the present invention is to provide a device for thermal and radar/visual camouflage that enables achieving of an automatic thermal adaptation of the surroundings and active visual adaptation and/or passive radar adaptation and which enables achieving an un-even thermal/visual structure.

Another object of the present invention is to provide a device for thermally mimicking e.g. other vehicles/crafts in order to provide thermal and visual identification of own troops by means of thermal and/or radar signature or to provide opportunities for infiltration by means of thermal or radar signature adaptation in or around e.g. enemy troops during suitable circumstances.

SUMMARY OF THE INVENTION

These and other objects, apparent from the following description, are achieved by a device for signature adaptation and an object that exhibits the features recited the characterizing clause of the appended independent claims 1 and ~~26~~ 24. Preferred embodiments of the device are defined in appended dependent claims 2-~~25~~ 23 respectively.

According to the invention the objects are achieved by a device for signature adaptation, comprising a surface element arranged to assume a determined thermal distribution, wherein said surface comprises at least one temperature generating element arranged to generate at least one predetermined temperature gradient to a portion of a first heat conducting layer of said

CLAIMS

1. Device for signature adaptation, comprising a surface element (100A; 100B; 100C; 100D; 100E; 100F, 500) arranged to assume a determined thermal distribution, wherein said surface element comprises at least one temperature generating element (150; 150:5, 150:6, 150:7), having an outer portion (150:A) arranged to generate at least one predetermined temperature gradient to a portion of a first heat conducting layer (80) of said surface element, **characterized by** that said device for signature adaptation comprises a liquid cooling element (LCE) arranged to provide at least one liquid flow, thermally contacting an inner portion (150:B) of said at least one temperature generating element so that thermal energy is dispersed from the inner portion of said at least one temperature generating element in order to generate the at least one predetermined temperature gradient to the portion of the first heat conducting layer (80), wherein said surface element comprises a plurality of temperature generating elements, each arranged to generate a predetermined temperature gradient to a portion each of said first heat conducting layer of said surface element and wherein said liquid cooling element comprises a liquid cooling element layer (LCEL), inwardly of said first heat conducting layer, wherein said liquid cooling element layer comprises a plurality of apertures (AP, A1-A3, B1-B4, C1-C5, D1-D4, E1-E3) arranged to receive said plurality of temperature generating elements so that said plurality of temperature generating elements thermally contacts a portion of a heat plate structure (HPS), arranged inwardly of and facing said liquid cooling element layer and being arranged to disperse the thermal energy from said plurality of temperature generating elements in direction along the surface of the heat plate structure.

2. Device according to claim 1, wherein said liquid cooling element is configured for coupling to at least one pump (PU) arranged to provide at least one liquid flow to said liquid cooling element.

~~3. Device according to any of the preceding claims, wherein said surface element comprises a plurality of temperature generating elements, each arranged to generate a predetermined temperature gradient to a portion each of said first heat conducting layer of said surface element.~~

~~4. Device according to claim 3, wherein said liquid cooling element comprises a liquid cooling element layer (LCEL), inwardly of said first heat conducting layer, wherein said liquid cooling element layer comprises a plurality of apertures (AP, A1-A3, B1-B4, C1-C5, D1-D4, E1-E3) arranged to receive said plurality of temperature generating elements so that said plurality of temperature generating elements thermally contacts a portion of a heat plate structure (HPS), arranged inwardly of and facing said liquid cooling element layer and being arranged to disperse the thermal energy from said plurality of temperature generating elements in direction along the surface of the heat plate structure.~~

~~5.~~3. Device according to ~~claim 4~~ any of claims 1-2, wherein said liquid cooling element (LCE) comprises a liquid cooling plate (LCP) and wherein said liquid cooling plate is arranged to be applied thermally contacting a portion of said heat plate structure.

~~6.~~4. Device according to any of claims ~~4-5~~ 1-3, wherein said plurality of apertures of the liquid cooling element layer are arranged in a geometrical pattern in the form of a plurality of column and wherein said heat plate structure comprises a plurality of heat plates (HP1-HP5), arranged to be applied to the liquid cooling element layer so that each of the heat plates overlaps a column of said plurality of column of apertures of the liquid cooling element layer.

~~7.~~5. Device according to ~~claim 6~~ any of claims 1-4, wherein the heat plate structure comprises a transversal heat plate (HP6) arranged to thermally contact a central portion of each of said plurality of heat plates (HP1-HP5)

and wherein said liquid cooling plate is arranged to be arranged facing said transversal heat plate.

~~8.~~6. Device according to any of claims ~~2-7~~ 2-5, wherein said liquid cooling element is configured for coupling to said at least one pump via at least one conduit arranged for transport of said at least one liquid flow.

~~9.~~7. Device according to any of claims ~~2-8~~ 2-6, wherein said at least one liquid flow comprises at least one cooling medium.

~~10.~~8. Device according to claim ~~9~~ 7, wherein said at least one cooling medium comprises water.

~~11.~~9. Device according to any of the preceding claims, wherein said liquid cooling element is arranged to be supplied with said at least one liquid flow from at least one reservoir (RE) comprising cooling medium.

~~12.~~10. Device according to claim ~~11~~ 9, wherein said at least one reservoir (RE) is comprised of ocean- or sea-water.

~~13.~~11. Device according to any of the preceding claims, wherein said surface element comprises at least one display surface (50) arranged to radiate at least one predetermined spectrum.

~~14.~~12. Device according to claim ~~13~~ 11, wherein said at least one display surface comprises a plurality of display sub-surfaces (51A-51K), wherein said display sub-surfaces are arranged to radiate at least one predetermined spectrum in at least one predetermined direction, wherein said at least one predetermined spectrum is directional dependent.

~~15.~~13. Device according to claim ~~14~~ 12, wherein said at least one predetermined direction for each display sub-surface (51A-51K) is individually displaced relative to an orthogonal axis of said display surface (50).

~~16.~~14. Device according to any of claims ~~14-15~~ 12-13, wherein said at least one display surface (50) comprises an obstructing layer (52) arranged to obstruct incident light of selected angles of incidence and an underlying curved reflecting layer (51) arranged to reflect incident light.

~~17.~~15. Device according to any of the preceding claims, wherein the surface element comprises at least one additional element (190) arranged to provide radar suppression.

~~18.~~16. Device according to any of the preceding claims, wherein said surface element comprises at least one additional element (180) arranged to provide armour.

~~19.~~17. Device according to any of the preceding claims, wherein said first heat conducting layer (80) has anisotropic heat conductibility such that heat conduction mainly occurs in the main direction of propagation of the layer (80).

~~20.~~18. Device according to any of the preceding claims, wherein the surface element comprises an intermediate heat conducting element (160) arranged inwardly of and facing the temperature generating element, wherein the intermediate heat conducting element has anisotropic heat conductibility such that heat conduction mainly occurs crosswise to the main direction of propagation of the first heat conducting layer.

~~21.~~19. Device according to any of the preceding claims, wherein the surface element has a hexagonal shape.

~~22.~~20. Device according to any of the preceding claims, further comprising a thermal sensing means (610) arranged to sense surrounding temperature, e.g. thermal background.

~~23.~~21. Device according to any of claims ~~13-16~~ 11-14, further comprising a visual sensing means (615) arranged to sense the visual background of the surrounding, e.g. visual structural background.

~~24.~~22. Device according to any of the preceding claims, wherein the device comprises a plurality of surface elements (100A-100F, 500), wherein the liquid cooling element of each of said surface element is coupled in parallel, to at least one conduit (L2) for inflow of said at least one liquid flow and to at least one conduit (L3) for ~~inflow~~ outflow of said at least one liquid flow.

~~25.~~23. Device according to any of the preceding claims, wherein the device comprises a framework (710) or support structure (750;755), wherein the framework or support structure is arranged to support a plurality of interconnected surface elements (100A-100F, 500) and to provide current and control signals/communication to said plurality of interconnected surface elements.

~~26.~~24. Object (800), for example a marine craft (800), comprising a device according to any of the preceding claims.