payload module 412. In various embodiments, each of the peripheral slot 113 may comprise a rail 117 moveably coupleable to the peripheral payload mount 420. A coupling provided between rail 117 and the peripheral payload mount 420 may enable a displacement of the peripheral payload module 412 along the respective radial axis 84, thus enabling positional adjustment of the peripheral payload module 412 along the radial axis 84 by the single user. Further, the rail 117 may also aid in the attaching and/or detaching of the peripheral payload module 412 (or the peripheral payload mount 420) to the respective peripheral slot 113, by supporting the weight of the peripheral payload module 412.

[0080] FIGs. 9A and 9B illustrate exemplary peripheral payload modules 412 and the respective peripheral payload mounts 420. The peripheral payload modules 412 may include oversized payloads (FIGs. 8 and 9A) as well as odd shaped/elongated payloads (FIG. 9B). In exemplary embodiments, electronics and/or miniature float modules 415 may be attached to the peripheral payload mounts 420. FIGs. 10A, 10B and 10C further illustrate another exemplary peripheral slot 113 as well as the corresponding exemplary peripheral payload mounts 420.

[0081] Referring back to FIG. 4, in various embodiments, the payload modules 410 may include one or more core payload modules 414. The core payload modules 414 may be coupled to and be held by the frame 110 coupled within the periphery 102 of the buoy 100. In contrast to peripheral payload modules 412, the buoy dimension may remain unchanged responsive to attaching the core payload modules 414 to the buoy 100, and responsive to detaching the core payload modules 414 from the buoy 100. In various embodiments, attaching the core payload modules 414 to the frame 110/buoy 100 and detaching the core payload modules 414 from the frame 110/buoy 100 may both be manually operable by a single user.

[0082] Referring to FIGs. 5, 11 to 15, the buoy 100 may define at least one conduit 117 extending through the base frame 112 along or parallel to the buoyancy axis 82. One or more of the core payload modules 414 may be movably coupled to the at least one conduit 117.

the radial axis. One or more of the core payload modules 414 may be movably coupled to the peripheral conduit 117.

[0092] In various embodiments, the peripheral conduit 217 may extend from a top side of the float module 210 through a buoyancy plane of the buoy 100 to terminate at a bottom side of the float module 210. The buoyancy plane may correspond to a fluid level or expected fluid level relative to the buoy 100 in an operational environment, such as in the sea.

[0093] According to various embodiments, referring to FIG. 17, the buoy 100 may further comprise a peripheral conduit payload mount 440 for holding or disposing one or more core payload modules 414. The peripheral conduit payload mount 440 may be movable or slidable relative to the peripheral conduit 217 parallel to the buoyancy axis 82. Further, the peripheral conduit payload mount 440 may comprise an elongated support boom 442 coupled to a cage 444. The cage 444 may be configured to hold one or more core payload modules 414, such as sensors. As shown in FIG. 19A and 19B, the support boom 442 may be provided with a handle 443 for easy lifting by a single user, such as a maintenance crew.

[0094] Referring again to FIG. 10B, in various embodiments, the float modules 210 may include intermediate frames 213 for the peripheral conduit 217 and battery tray. The intermediate frames 213 may correspond to locations where contact is frequent. The intermediate frames 213 may be configured as replaceable protection frames, which may be swapped with a replacement piece by a user upon sustaining wear and tear during operation.

[0095] According to another aspect of the disclosure, disclosed herein a method of assembling a buoy system 50. The method comprises: providing a buoy, the buoy comprising a frame defining a buoyancy axis; and at least one float module coupled to the frame; and attaching at least one payload module to a periphery of the buoy along a radial axis, wherein the radial axis is orthogonal to the buoyancy axis.

[00117] Further, the boom provides a rosette-like sensor cage with a quick installation and removal mechanism to host diverse sensors in the central moonpool. The mechanism comprises a central socket system and standardized fixtures that may be inserted into the socket. To install new sensors, the users may use or provide clamps 437 specific to the respective sensors and attach the clamps to the adapter 438 (see FIG. 14). In the implementation, the sensor cage is provided with eight installation slots that are angularly distributed within a 155 mm toroidal space of 650 mm height (see FIG. 15).

[00118] For cylindrical sensors, which are a good approximation of most underwater sensors, the cage may host or house eight sensors with a 130 mm diameter. The single user may also install sensors up to 150 mm in diameter by taking up space for adjacent slots. Maximising the number of sensors to be carried by interlacing big and small sensors in the setup is possible.

[00119] Peripheral moonpool

[00120] The buoy provides four peripheral moonpools (or peripheral conduits) each with an internal diameter of 280 mm to support smaller sensors. A lightweight aluminium mounting frame with mounting rails is provided to hold multiple sensors rigidly in the peripheral moonpool. However, the number of sensors to be fitted in the mounting frame (or peripheral conduit payload mount) is constrained by the inner diameter of the cage of 110 mm and the exposed and in-water vertical space of about 750 mm. FIGs. 19A and 19B illustrate the standard moonpool operations and the lightweight aluminium frame (see FIG. 17).

[00121] The mounting dimensions (as shown in FIG. 24) of the mounting frame may be included as part of the open architecture interfaces of the proposed buoy system, thus allowing the single user to configure the relevant payloads as needed. When using the standard frame, the single user may produce suitable C-clamps that fit the sensors to the mounting rail.

[00122] Peripheral module bay

100W panels of FIG. 6B. As the PV panels are mounted to all six sides of the superstructure, a special flippable solar panel was created to allow maintenance access to the top.

[00149] Protecting PE/PU float from mounting wear and tear

[00150] It is known that various marine environmental sensors or payload modules often require frequent cleaning and maintenance. The maintenance process often involves frequent removal and re-installation of payload modules or sensors through the moonpools. Hence, the mounting inserts on the PE/PU float moonpools (peripheral moonpools) which are frequently accessed, is often subjected to high wear and tear. As the mounting inserts are typically molded in place, the mounting inserts are irreparable. The proposed buoy system/buoy comprises intermediate frames for enduring wear and tear typically sustained by the float during repair or maintenance. FIG. 30 shows the intermediate frames 213 used for peripheral moonpools and battery tray. The intermediate frames 213 may be replaceable protection frames which may be swapped with a replacement piece upon sustaining wear and tear during operation.

[00151] Waterproofing of standard batteries

[00152] FIG. 31A illustrates a battery bay formed in the PE/PU float (or float module). Disposing the batter in the float enables the centre of gravity to be lowered, enhancing stability. However, this puts a requirement on the batteries to be waterproofed. FIG. 31B shows a low-cost and flexible enclosure solution to waterproof a standard sealed cuboid battery with minimal size increment. The solution comprises a custom-designing a tray system and a potting process to irreversibly seal the battery within an enclosure.

[00153] Renewable energy system

[00154] The proposed buoy system/buoy is configured with a renewable energy generation system using solar panels as a primary power source. FIG. 32 shows a system diagram of a renewable energy setup in MESN of the proposed buoy system/buoy. The energy generation