A SHIP HAVING A HULL AND A PROPULSION SYSTEM

The invention relates to a ship having a hull and a propulsion system, the propulsion system comprising an engine, a transmission and a shaft system fixedly installed in the ship for driving a propeller.

Such propulsion systems are generally arranged on foundations prepared in the ship and are subsequently connected to the requisite supply lines. A disadvantage of the previously known fixed arrangement of the propulsion aggregates in a ship is, on the one hand, the relatively complicated and expensive assembly work and also the difficulties of exchanging engine parts which have become faulty. In addition the introduction of noise and vibration into the ship's hull is very considerable with the previously known propulsion aggregates.

A propulsion system for watercraft and aircraft is already known (DE-PS 319 381) in which the propulsion engine is journalled in a resiliently suspended cradle which can oscillate freely in all directions so that any sort of movements of the engine cannot be passed on to the vehicle fuselage or hull. A disadvantage of the known propulsion system is however that it can only be inserted and mounted when the deck has not yet been

installed, and that the suspension on the springs is on the one hand difficult to bring about and on the other hand leads to a mounting which is much too unstable and which can work itself up into a state of oscillation at certain frequencies.

The object of the present invention is thus to provide a propulsion system for ships of the initially named kind which can be economically installed and also removed, in which the transmission of noise and vibration to the ship's hull is reduced without the danger of engine oscillations building up, and with which servicing, repair and maintenance work can be carried out in an economical manner. The propulsion aggregate should also be of space-saving and compact construction and have a high operational reliability, even in the event of damage (for example breaking out of fire, battle damage or flooding with water).

In order to satisfy this object there is provided, in accordance with the present invention a ship having a hull and a propulsion system, the propulsion system comprising an engine, a transmission, a shaft system fixedly installed in the ship's hull for driving a ship's propeller, an engine module of box-like shape containing said engine, said engine module being suspended at the top in fixed mounts of the ship from a ship's deck, and an axial-radial compensation joint arranged between said engine module and said shaft system fixedly installed in the ship's hull, wherein said ship's deck has an opening having a larger cross-section than said engine module for the introduction of said engine module into position in said hull, with said opening being disposed at the top of said engine module and being closable by a removable cover.

A ring seal is preferably disposed between said removable cover and said opening.

The construction is preferably such that said transmission is also accommodated in said engine module and said axial-radial compensation joint is provided between said transmission (gearbox) and said shaft system outside of said engine module. With this arrangement the axial-radial compensation joint should in particular be formed by two cardan or universal joints arranged axially spaced apart and by an axial compensation piece located therebetween.

In a further advantageous embodiment said shaft system includes a combined radial-axial pressure bearing secured to said ship's hull aft of said axial-radial compensation joint. A propeller adjustment device is then, in particular, combined with said radial-axial pressure bearing.

The thought underlying the present teaching is thus to be seen in the concept that a compact module, in particular having the shape of a parallelepiped, containing the most important parts of the propulsion aggregate can be inserted into the ship's hull as a prefabricated unit. All supply lines can then be attached to the inserted module at one or two interfaces. Moreover, the module should have a control unit which can operate in analog or digital manner. The engine should be capable of being started within the module with it being possible to use compressed air introduced into the module as a starting aid. In this manner it is also possible to allow the engine to run for test purposes while the module is located outside of the ship.

In the event that a hydrostatic transmission is used the axial-radial compensation joint can also be realised by hoses connecting the hydropump and the hydromotor.

A particular advantage of the proposed arrangement lies in the fact that the engine and transmission do not need to be aligned relative to the shaft system. The mounting in the upper region of the module results in simpler installation; moreover the vibrational behaviour of the module is made more favourable in this way.

The axial-radial compensation joint present between the module and the shaft system leads to a troublefree rotary connection between the module which is preferably suspended for damped oscillations and the shaft system which is fixedly installed in the ship's hull. The damped resilient suspension in the upper region can be realised in particularly compact and stable manner if laterally projecting carrying arms are provided at the top of said engine module and are secured via vertical shock dampers, which are mounted below them, to the said fixed mounts which are disposed below said opening with said opening being sufficiently wide that said carrying arms also pass through it. A plurality of vertical shock dampers which are spaced from one another is preferably provided in the longitudinal direction.

An advantageous constructional realisation of the present teaching is so designed that said fixed mounts are formed as elongate plates, extend laterally beyond the carrying arms and are attached to longitudinal beams secured beneath said ship's deck. With this arrangement said cover is preferably flush with said ship's deck.

In order to also damp lateral oscillations of the module lateral supports are provided for said engine module and are secured to said ship's hull and positioned in the

lower region of said engine module at the sides thereof. This can for example be realised by an arrangement in which the lateral supports consist of a mounting pedestal secured to said ship's hull and a lateral shock damper provided between said mounting pedestal and a side of said engine module.

In order to avoid any later installation work in the lower region of the module provision should be made, in accordance with a particularly preferred practical embodiment, that each lateral shock damper is secured to the mounting pedestal and merely contacts the module, and indeed preferably at a counter-plate.

In order to be able to also damp oscillations of the module which occur in the longitudinal direction of the ship axial shock dampers which act in the longitudinal direction of the ship are preferably provided in the upper region of the module at the front, and/or at the rear, between said engine module and respective supports fixed to the ship. For the purpose of simple installation provision should also be made in this case that the axial shock dampers are fixedly arranged on the ship's hull and merely contact said engine module, and indeed preferably at counter-plates which are specially provided for this purpose.

A particularly preferred constructional realisation of the modular concept underlying the present teaching is characterised in that the engine module comprises a box frame containing the engine, with the box frame preferably being assembled from steel sections. For this purpose standard sections can in particular be used whereby the box frame can be manufactured very economically.

The engine foundations are expediently attached to the longitudinal floor beams of the box frame. The engine foundations can in particular be realised by completing the longitudinal floor beams into box beams by sheet metal plates which are welded thereto, with the box beams being expediently constructed as oil containers. In this manner the fresh oil, waste oil, and dry sump techniques can be practiced within the module.

The box frame is so conceived in accordance with the present teaching that no installed part breaks through the imaginary boundary planes of the module.

Moreover, the box frame should have a fixedly installed floor of metal or of a metal sandwich construction.

Furthermore, it is expedient if the box frame is clad with acoustic and thermal insulating material to produce an engine module with smooth surfaces. For this purpose it is possible to use metal-sandwich elements which can be installed in water-tight manner. This makes reliable operation possible even when the engine rooms are flooded. Furthermore, the sandwich cladding can be used with an appropriate ceramic coating as fire and schrapnel protection. Module ventilation is provided in the event that the module is fully clad. Cold feed air is supplied via the enlarged charging air duct and indeed via a separate fan with a pressure of ca. 500 mm of water column. Hot air from the interior of the module can be discharged via the exhaust pipes via an ejector with non-return flap.

Furthermore, it is advantageous when, with a closed engine which is clad so that it is water-tight, a transmission drive shaft or an engine drive shaft is guided with a bulkhead pipe fitting through a rear wall of said box frame.

In smaller ships having an engine room with a height correspondingly to the spacing between two decks, and which generally have a water displacement of less than 500 tons, the present teaching provides that all engine auxiliary devices such as the exhaust system, air induction ducts, radiator etc. are also arranged in said engine module. Apart from the engine and the transmission all auxiliary devices such as heat exchanger, sea water cooler, fresh water cooler and lubricating oil cooler and also any reserve pumps and fans are thus also installed in the module. The supply lines for these items are brought in centrally and attached via a terminal with quick couplings and hose connections or compensators. The necessary electrical supply is ensured via a second terminal which forms part of the local operating panel. The liquid terminal lies at the long side amidships whereas the electrical terminal with the operating panel is arranged at the head end of the module. Special operational criteria arise for smaller ships, for which the present module system has been designed, as follows:

Relatively high mean permanent load,
short service intervals,
high shock loading,
high noise generation.

In such small ships the engine module is suspended from the top largely flush with the uppermost deck and fitted in gas and water-tight manner. The opening provided in the deck for the insertion of the engine module is subsequently closed in sealed manner by a cover. For very small ships in which one deck height is not sufficient for accommodating an engine module provision can be made for the plate-like mounts to be arranged at deck level and for the cover to be secured to an upper

edge of a coaming surrounding the opening.

The present teaching can however also be applied to larger ships having a machine room which extends over several decks, for example with corvettes with up to 1000 tons water displacement. In this case provision is made for a plurality of modules to be arranged above one another with each individual module being suspended below a respective deck.

By way of example the engine and transmission can be located in the lowermost module, the exhaust and air supply arrangements and the electrical generator can be located in the module arranged above it and for example the air conditioning apparatus can be arranged in the topmost module. In this way a series of small compact engine rooms which are arranged above one another is provided which taper in pyramid-like manner towards the bottom of the ship.

The invention thus envisages, for the easy insertion and removal of modules arranged above one another, that the modules which follow one another progressing from the bottom to the top have successively increasing horizontal cross-sections such that the lower modules can be inserted or removed through the spaces for accommodating the upper modules.

It is particularly advantageous when the engine and/or the transmission are resiliently mounted inside the engine module. Although rigid installation of the engine and/or transmission in the module is possible as a result of the resilient suspension of the module itself, a resilient installation is however preferred. Thus double-resilient mounting is possible without additional effort. Fundamentally however the engine module can also be rigidly mounted in the ship's hull.

The mass distribution between the engine and the box frame including the auxiliary apparatus can be selected favourably in accordance with the invention. The excitation mass can for example amount to 10 t, the mass of the box frame with the auxiliary apparatus 5 to 7 t, so that a ratio of excitation mass to passive mass of approximately 2 to 1.5 : 1 is present. It is particularly preferred if the ratio of the mass of the engine to the residual mass of the module amounts to from 3 : 1 to 1 : 1 and in particular to 2 : 1.

A further important feature of the presently proposed modular construction lies in the separation of the pressure bearing and transmission through the arrangement of the axial-radial compensation joint.

The manner of construction of the engine module makes simple and rapid installation and removal of the engine and of the transmission possible during repair and servicing work. This in turn brings time and cost savings. It is possible to change an engine or transmission within a short time in the event of damage, particularly as complicated alignment work is avoided.

Fundamentally however the pressure bearing could remain in the transmission with smaller ships and the module could be simply resiliently arranged in the ship. With this arrangement a support via silent blocks is likewise provided at the lower frame plate of the box frame of the engine module in order to accommodate the axial thrust at the head side of the engine module. This however requires a corresponding alignment of the module in the ship relative to the shaft. The normal mounting via shock elements, or double resilient mounting with correspondingly soft matching and suspended installation, reduces the shock loads when consistently

applied, and thus permits less expensive constructions and above all the use of individual components which are good value for money, because the highest shock loadings occur at the outer skin and on the floor of the ship. In the same way the radiation of noise is favourably influenced.

The way in which the module is built in makes it possible to completely pre-equip the engine room before the module is inserted into the ship's hull. The alignment of the shaft guide is hereby considerably simplified because it is only necessary to align it up to the pressure bearing.

The dimensions of an engine module can be as follows when installing an engine, a transmission, an exhaust gas silencer and an induction duct: length 5.4 m, width: 2,4 m, height: 3,6 m.

If the module is executed without silencer and without induction ducts then the height can be reduced to approximately 3 m.

A particular advantage of the presently proposed modular system lies in the fact that the engine rooms can be laid out so that they are extremely small because a large proportion of the servicing can be effected by exchange in the course of only a few hours. Even intermediate refits can be easily carried out by removing a module from the ship and inspecting it either on the deck or on the quay. When several modules are arranged above one another the lower module can easily be made accessible by removing the upper module. The present proposal thus provides for the first time complete exchangeability of the propulsion aggregate.

The engine room can be completely prepared outside of the ship including all conduits and even painting and marking work can also be carried out outside of the ship.

The use of shock dampers in accordance with the present teaching instead of pure springs ensures resilient mounting without the danger of oscillations building up because a damping component is additionally provided.

The invention will now be described in the following by way of example and with reference to the drawings which show:

Fig. 1 a partly sectioned side view of a propulsion aggregate in accordance with the invention and of modular construction,

Fig. 2 a partly sectioned rear view of the propulsion aggregate of Fig. 1 on the line II-II of Fig. 1,

Fig. 3 the detail III of Fig. 2 to an enlarged scale,

Fig. 4 the detail IV of Fig. 2 to an enlarged scale,

Fig. 5 a partly sectioned plan view of the subject of Figs. 1 and 2 on the lines IV-IV of Figs. 1 and 2,

Fig. 6 a perspective view of the propulsion aggregate described with reference to Figs. 1 to 5 with the surrounding parts of the ship's hull in the exploded state,

Fig. 7 a partly sectioned side view of the completed propulsion aggregate of the invention after installation in a ship's hull,

Fig. 8 a perspective view analogous to Fig. 6 of a further embodiment,

Fig. 9 a schematic section of a ship at right angles to its longitudinal axis with a propulsion aggregate distributed between several modules which are arranged above one another,

Fig. 10 a schematic side view of a preferred embodiment of a propulsion aggregate in accordance with the invention and of modular construction, with the exhaust silencer and the air induction ducts being arranged in the module,

Fig. 11 a schematic partial side view of a propulsion aggregate in accordance with the invention and of modular construction, however with only the feedlines to the engine silencer and to the air induction ducts being provided in the module,

Fig. 12 a schematic sideview of a module in accordance with the invention with inclined engine and transmission,

Fig. 13 a schematic sideview of a module in accordance with the invention containing engine and transmission, with the engine being resiliently mounted at the module, and

Fig. 14 a schematic sideview of a further advantageous embodiment of the propulsion aggregate of the invention in modular construction, with a

container containing further apparatus and systems being placed on the module containing the engine and the transmission.

As seen in Figs. 1 to 7 the module 13 which has the shape of a parallelepiped consists of a box-frame with several longitudinal floor beams 31 which extend parallel to one another and which are completed into box beams 32 which can be used as oil tanks by top and bottom sheet metal plates 32" and 32' respectively. The longitudinal floor beams 31 are fixedly secured at the front and at the rear by transverse beams 9. Vertical beams 10 are located at the four corners and are secured at the top to the corners of a rectangular frame which consists of longitudinal beams 40 which are spaced apart sideways and transverse beams 40' which connect the latter at the front and rear. The longitudinal beams 31 form a foundation for an engine 11 and for a transmission 12 arranged behind it. In the upper region 13 of the module there are also mounted a silencer 38, the opening of the connection flange 38' of which lies in the region of the rear surface of the module 13, and an air induction duct arrangement 39, the opening of the connection flange 39' of which lies in the region of the front surface of the module 13. The motor 11 and transmission 12 are connected to one another drivewise by a shaft 55.

The upper longitudinal beams 40 of the box-frame forming the module 13 have, as seen in Figs. 1 to 3 and 6, laterally projecting carrying arms 22. In each case two vertical shock-dampers 23 are secured to the bottom of the carrying arms 22, with the vertical shock absorbers being arranged parallel to and alongside one another, and being supported at the bottom at a distance corresponding to their length on a mounting 14 fixed to the ship which is constructed as a horizontal plate.

Each of the mountings 14 projects sideways beyond the shock-dampers 23 and is secured from below to a longitudinal beam 24 which, as seen in Figs. 3 and 6, is secured at the top beneath the ship's deck 25 by means of a ring plate 42. Ring plate 42 surrounds a deck opening 36 which is made somewhat larger than the module 13. Reinforcement plates 41 are provided externally at specific distances in the longitudinal direction of the ship on the longitudinal beams 24 and on the mountings 14, perpendicular to the mountings 14 and to the longitudinal beam 24 and, as shown in Figs. 3, 6, extend around the mounting 14 and the longitudinal beam 24 in a right angle. Five carrying arms 22 each having two shock dampers 23 arranged alongside one another are uniformly distributed along each of the upper longitudinal beams. The total weight of the module 13 and the parts which are built therein hangs on the carrying arms 22.

As seen in Figs. 2, 4 and 5 side supports 26 are provided at the sides the region of the four corners and consist of a mounting pedestal 27 which is secured to the ship's hull 15 and lateral shock-dampers 28 which are arranged between the latter and the longitudinal floor beams 31. In this manner lateral oscillations of the module 13 are damped in the lower region. The lateral shock-dampers 28 are fixedly connected with the mounting pedestals 27 and have support plates 28' at their ends facing the module 13 which extend parallel to the associated side surface of the module 13. Counter-plates 28' which are secured to and extend parallel to the longitudinal beams 31, as shown in Fig. 6, are associated with the bearing plates 28'. When the module 13 is installed the plates 28', 28" lie in close contact with one another.

As seen in Fig. 6 axial shock-dampers 29 are also arranged between the upper transverse beams 40' and/or

the lower transverse beams 9 and supports 30, 30', which are fixedly mounted to the ship, in order to damp longitudinal oscillations of the module 13.

The axial shock dampers 29 are likewise provided with end plates 29' which cooperate with the counter-plates 29" on the module 13 in such a way that when the module 13 is installed they come into hard contact with the counter-plates 29'.

Above the module 13 there is is located, as seen in Figs. 2, 3 and 6, an opening 36 in the deck 25 corresponding to the cross-section of the module 13 including the carrying arms 22 through which the completed module 13 including the propulsion systems which are located therein can be introduced into the ship's hull until the vertical shock dampers 23 contact the mountings 14 where they can be secured by means of screws 43 (Fig. 3). The opening 36 can then be closed in water-tight manner by a correspondingly shaped cover 37 with a seal 44 laid therebetween (Figs. 3, 6).

In accordance with Fig. 6 a rectangular opening 7 corresponding to the horizontal cross-section of the module 13 is provided in accordance with the invention in the inner floor 8 of the ship's hull 15. The floor frame of the module 13 which is formed by the beams 9, 31 engages into the rectangular opening and the lateral shock-dampers 28 are provided at the level of the opening.

The frames 6 and longitudinal beams 5 of the ship's hull 15 are also illustrated in Fig. 6.

As seen in Fig. 6 cooling water hoses 4 can be mounted at the sides of the module 13 which can be connected to mating connection flanges 4' in the inner floor 8

alongside the rectangular opening 7 in order to supply the engine 11 arranged in the module 13 with cooling water which is supplied and removed via lines 3 from cooling water supply and removal locations respectively, which are not shown in the drawing.

As seen in Fig. 7 the shaft system 16 which is fixedly installed in the ship's hull 15 is located behind the parallelepiped-shaped module 13 which is suspended beneath the ship's deck 25. The shaft system includes an axial-radial compensation joint 17 which is inserted between the transmission 12 and the radial-axial pressure bearing 21 (Fig. 6). The axial-radial compensation joint 17 consist of two cardan or universal joints 18, 19 which are spaced apart from one another with an axial compensation piece 20 provided therebetween which can for example be realised by an arched spline sleeve coupling.

In addition a resilient intermediate coupling 45 can also be provided between the axial-radial compensation joint 17 and the output drive shaft 33 of the transmission 12.

In the embodiment of Figs. 1 to 7 the module 13 is constructed so that it is open on all sides, with it being particularly important that the cover 37 is sealed in troublefree manner at the ship's deck 25.

The entire shaft system 16 is installed in the ship's hull prior to introduction of the module 13. After the insertion and mounting of the module it is then only necessary to couple the output drive shaft 33 of the transmission 12 to the shaft system 16 and/or to couple the axial-radial compensation joint 17 with the radial-axial pressure bearing 21 which is fixedly mounted on the inner floor 8.

In order to remove the module 13 it is only necessary to release the coupling to the shaft system (16), whereupon the module 13 can be lifted out of the ship's hull by means of a lifting tackle after removal of the cover 37 and after the release of the supply lines and the connection bolts 43 (Fig. 3) between the module 13 and the bearings 14. No manipulations need to be effected at the shock dampers 28, 29. The insertion can if necessary be facilitated by the oblique ramps 28'", 29'" at the top and bottom of the plates 28', 28" and 29', 29" respectively which are shown in Fig. 4 and indicated in Fig. 6.

In Fig. 8 the same reference numerals are used to designate parts which have counter-parts in the preceding figures.

In addition to the previously described embodiment the module 13 is however completely surrounded by water-tight and preferably also sound-proofed cladding plates 47 from which there only emerge the various connections such as the exhaust pipe connection flange 38', the cooling water connection pipes 4 and the connection flange 50 for the transmission 12. As a result of the hermetic closure of the module 13 it is ensured that in the event of water breaking into the engine room the motor 11 with the attached aggregrates remains fully capable of being operated, which can be of particular significance in warships which are exposed to eventual bombardment or explosion of mines. The shaft connection stub 50 is passed in accordance with Fig. 8 through a water-tight bulkhead pipe fitting 34.

Furthermore, in the embodiment of Fig. 8 the mountings 14 which are formed as elongate plates arranged to the side of the deck opening 36 are not located under the

deck 25 but rather at the level of the deck 25. In order to now provide adequate space for the upper frame of the module 13, which is located above the mountings and consists of the beams 40,40', the deck opening 36 is surrounded by a coaming 51 the upper edge 52 of which is constructed as a contact surface for the ring seal 44 and for the cover 37. In the embodiment of Fig. 8 the cover 37 is thus secured to the surface 52 of the sill 51 by means of bolts introduced into the bores 52, 52'. This embodiment is particularly suited to ships in which the height between the inner floor 8 and the deck 25 is not quite sufficient to accommodate the engine. When viewed from the point of view of stability the embodiment of Fig. 8 is indeed to be preferred because the forces which are transmitted from the module 13 to the ship's hull 15 can be transmitted directly at the level of the deck so that no intermediate members such as the longitudinal beam 24 of Fig. 6 are necessary.

As seen in Fig. 9 three modules 13, 13', 13" are suspended above one another from three ship's decks 25, 25', 25" which are arranged above one another. In order that the lower modules 13, 13' can be removed upwardly after removal of the modules 13 and 13" which are respectively located above them the horizontal cross-sections of the modules 13, 13' and 13" and also of the deck openings 36, 36', 36" are made successively larger when going from the bottom to the top.

Whereas the engine 11 and the transmission 12 are arranged in the lower module 13, the generator 46 and also the air supply and extraction aggregate 47 can for example be located in the central module 13' and the air conditioning unit 48 can for example be accommodated in the upper module 13". The total arrangement is then closed by a sealingly mounted cover 37.

Fig. 10 shows a preferred embodiment of the propulsion unit of the invention, once again in schematic form, with the same reference numerals again being used to designate parts which correspond to those in the preceding embodiments. One can see particularly clearly in Fig. 10 that the total module 13 including the units which are located therein, such as the engine 11, transmission 12, silencer 38 and air induction ducts 39 are resiliently suspended from the ship's hull 15 via the vertical shock absorbers 23. The shock absorbers 23 should, in accordance with the present teaching have a spring path from 30 to 70 mm.

Fig. 11 schematically shows an embodiment in which only the engine 11 and the transmission 12 are horizontally arranged within the module 13 while the silencer and the air induction ducts are provided outside of the module 13 in manner not shown, with ducts 38', 39' for the attachment of these units being present inside the module 13 in the manner indicated in Fig. 11.

The embodiment of Fig. 12 is intended to show that the engine 11 and the transmission 12 can also be arranged inclined at an angle α to the longitudinal ship's axis in such a way that the ship's shaft can be directly connected to the transmission 12 via the radial-axial pressure bearing 21 without a change of direction.

A particularly preferred embodiment is shown in Fig. 13 in which a double elastic support for the engine 11 is present in that the latter is mounted via resilient elements 53 to the foundation of the module 13, while the transmission 12 is fixedly connected with the base frame of the module 13. In order to avoid the transmission of vibrations through the connection shaft 55 between the motor 11 and the transmission 12 resilient intermediate elements 54 are built into the

connection shaft 55 which are also able to transmit the required torques, and which can also be present in the embodiments of the preceding figures.

Particularly good vibration damping is achieved when the residual mass of the module (13), i.e. its mass with the exception of the engine 11 amounts to approximately 50% of the mass of the engine 11. If required a corresponding excitation mass, for example in the form of concrete, should be provided in the foundation of the module 13 in order to maintain this ideal mass ratio between the engine 11 and the residual mass of the module 13.

This favourable mass ratio can be achieved in accordance with Fig. 14 via a container 55 which is mounted on the module 13 so that no special dead masses have to be provided on the module 13.

The container 55, which can for example contain an electrical generator or other units, should also expediently be resiliently braced in the horizontal direction in the lower region on the ship's deck 25 via damped resilient supports 56. This embodiment can also be used with advantage when the resilient support 53 of the motor 11 on the floor of the module 13 is not provided.

In order to bring about an adequate seal relative to the interior of the ship's hull in the region in which the container 55 is placed the resilient support 56 is preferably formed as a resilient all-around seal; the container 55 thus sits rigidly on the module 13 but resiliently and in sealed manner on the deck 25 of the ship's hull.



Claims

1. A ship having a hull and a propulsion system, the propulsion system comprising an engine, a transmission, a shaft system fixedly installed in the ship's hull for driving a ship's propeller; an engine module of box-like shape containing said engine, with said engine module being suspended at the top in fixed mounts of the ship from a ship's deck, and an axial-radial compensation joint arranged between said engine module and said shaft system fixedly installed in the ship's hull, wherein said ship's deck has an opening having a larger cross-section than said engine module for the introduction of said engine module into position in said hull, with said opening being disposed at the top of said engine module and being closable by a removable cover.

2. A ship in accordance with claim 1, wherein a ring seal is disposed between said removable cover and said opening.

3. A ship in accordance with either claim 1 or claim 2, wherein said transmission is also accommodated in said engine module and said axial-radial compensation joint is provided between said transmission and said shaft system outside of said engine module.

4. A ship in accordance with any one of the preceding claims, wherein said axial-radial compensation joint is formed by two cardan joints arranged axially spaced apart and by an axial compensation piece located therebetween.

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5. A ship in accordance with one of the preceding claims, wherein said shaft system includes a combined radial-axial pressure bearing secured to said ship's hull aft of said axial-radial compensation joint.

6. A ship in accordance with claim 5, wherein a propeller adjustment device is combined with said radial-axial pressure bearing.

7. A ship in accordance with one of the preceding claims, wherein laterally projecting carrying arms are provided at the top of said engine module and are secured via vertical shock dampers, which are mounted below them, to the said fixed mounts which are disposed below said opening, with said opening being sufficiently wide that said carrying arms also pass through it.

8. A ship in accordance with claim 7, wherein a plurality of vertical shock dampers which are spaced from one another is provided in the longitudinal direction of said engine module.

9. A ship in accordance with claim 7 or claim 8, wherein said fixed mounts are formed as elongate plates, extend laterally beyond said carrying arms and are attached to longitudinal beams secured beneath said ship's deck.

10. A ship in accordance with claim 9, wherein said cover is flush with said ship's deck.

11. A ship in accordance with one of the preceding claims, wherein lateral supports are provided for said engine module and are secured to said ship's hull and positioned in the lower region of said engine module at the sides thereof.



12. A ship in accordance with claim 8, wherein said lateral supports consist of a mounting pedestal secured to said ship's hull and a lateral shock-damper provided between said mounting pedestal and a side of said engine module.

13. A ship in accordance with claim 12, wherein each lateral shock-damper is secured to the associated mounting pedestal and merely contacts said engine module.

14. A ship in accordance with claim 13, wherein each said lateral shock-damper contacts said engine module at a counter-plate.

15. A ship in accordance with one of the preceding claims, wherein axial shock-dampers which act in the longitudinal direction of the ship are provided in the upper and/or lower region of said engine module at the front and/or at the rear between said engine module and respective supports fixed to the ship.

16. A ship in accordance with claim 15, wherein said axial shock-dampers are fixedly arranged on the ship's hull and merely contact said engine module.

17. A ship in accordance with claim 16, wherein said axial shock-dampers contact said engine modules at counter-plates.

18. A ship in accordance with one of the preceding claims, wherein said engine module comprises a box-frame containing said engine.

19. A ship in accordance with claim 18, wherein said box frame has longitudinal floor beams to which engine foundations are attached.

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20. A ship in accordance with claim 18, wherein said longitudinal floor beams are completed into box beams by sheet metal plates which are welded thereto.

21. A ship in accordance with claim 20, wherein said box beams are constructed as oil containers.

22. A ship in accordance with the claims 18 to 21, wherein said box frame has a fixedly installed floor of metal or of a metal sandwich construction.

23. A ship in accordance with one of the claims 18 to 22, wherein said box frame is clad with acoustic and thermal insulating material, to produce an engine module wth smooth surfaces.

24. A ship in accordance with claim 18, wherein said module is clad so that it is water-tight and a transmission drive shaft or an engine drive shaft is guided with a bulkhead pipe fitting through a rear wall of said box frame.

25. A ship in accordance with any one of the preceding claims, wherein said fixed mounts are arranged at the level of said ship's deck and said cover is securable to an upper edge of a coaming surrounding said opening.

26. A ship in accordance with one of the preceding claims having an engine room with a height corresponding to the spacing between two decks, wherein all engine auxiliary devices such as the exhaust system, air induction ducts, radiator etc. are also arranged in said engine module.

27. A ship in accordance with one of the preceding claims having a machine room which extends over several

decks, wherein several modules are arranged above one another, with each individual module being suspended below a respective deck.

28. A ship in accordance with claim 27, wherein the modules which follow one another progressing from the bottom to the top have successively increasing horizontal cross-sections such that the lower modules can be inserted or removed through the spaces for accommodating the upper modules.

29. A ship in accordance with one of the preceding claims, wherein said engine is resiliently mounted inside said engine module.

30. A ship in accordance with claim 29, wherein the ratio of the mass of the engine and optionally of said transmission to the remaining mass of the module amounts to from 3:1 to 1:1.

31. A ship in accordance with claim 30, wherein said ratio amounts to substantially 2:1.

32. A ship in accordance with claim 30, wherein said engine is connected with said transmission via a shaft having a resilient intermediate piece.

33. A ship in accordance with one of the claims 24 to 32, wherein the remaining mass of the module is increased to a predetermined value by a ballast mass secured in its lower region.

34. A ship in accordance with one of the claims 29 to 33, wherein a container with aparatus, systems and the like arranged therein is arranged above said engine module.

35. A ship in accordance with claim 34, wherein said container is sealed and sprung in the lower region relative to said ship's deck by a resilient all-around seal.

36. A ship in accordance with one of the preceding clims, wherein said engine, said transmission and said engine module are horizontally disposed, whereas said shaft system is inclined to the horizontal, and wherein the adaptation to the inclination of the shaft system takes place via said axial-radial compensation joint.

37. A ship in accordance with one of the claims 1 to 35, wherein said engine module is horizontally arranged in the ship, whereas said engine and said transmission are secured rearwardly inclined to a base frame of said engine module.

38. A ship substantially as herein described with reference to and as shown in the accompanying drawings.