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(54) Benævnelse: **CONTAINER SHIP**

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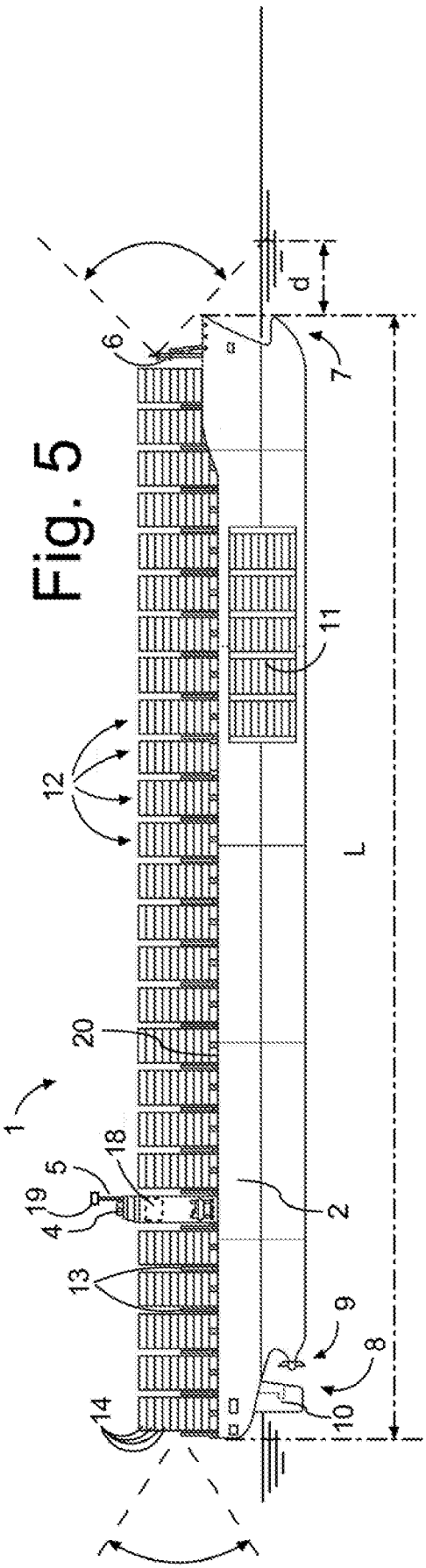
(57) Sammendrag:
A container ship configured for stowing a plurality of shipping containers above the open deck. The container ship comprises at least one digital video camera arranged to capture a field of view forward of the forward of bow of the container ship, a bridge provided with instruments for direction control, instruments for engine control, and with at least one display screen coupled to the at least one digital video camera for real time reproduction of images captured by the digital video camera.

Fortsættes ...

Fig. 5



CONTAINER SHIP

TECHNICAL FIELD

The disclosure relates to a container ship, i.e. a marine vessel configured for storage and transport of a large number of shipping containers, the disclosure relates in particular to a container ship with an increased capacity for stowing shipping containers.

BACKGROUND

Container ships are marine vessels (cargo ships) that are designed and constructed for transporting shipping containers (intermodal container). Typically, container ships carry all of their load in truck-size intermodal containers. Container ships are a common means of commercial intermodal freight transport and now carry most seagoing non-bulk cargo. Container ship capacity is measured in twenty-foot equivalent units (TEU). Typical loads are a mix of 20-foot and 40-foot (2-TEU) ISO-standard containers, with the latter predominant.

Shipping containers are stowed in the hull, i.e. below the open deck and above the open deck of a container ship. In the longitudinal direction of the container ship storage spaces divided into bays, in the transverse direction of the container ship the storage spaces divided in a number of rows and in the vertical direction the store space is divided in a number of horizontal container layers or tiers.

The shipping containers are stowed as high as possible with some container ships operating with up to ten or eleven tiers

above the open deck. However, the above deck bays located closest to the bow the maximum number of tiers that can be used is reduced in order to provide a free line of sight/visibility from the bridge to the surface of the water ahead of the container ship, as illustrated in Figs. 1 and 2. Fig. 1 shows a so-called twin island container ship in which the bridge and crew facilities are arranged in a tower that is separate from the engine funnels. Figure 2 shows a single island container ship in which the bridge, crew facilities and engine funnels are combined. The interrupted line 7 illustrates the line of sight from the bridge to the water surface. Maritime regulations require a field of view to the sea surface forward of the bow of the container ship that starts at a distance d that is less than the lesser of two ship lengths or 500 m forward of the bow of the container ship. Since the height of the bridge cannot be increased without negative consequences, such as the inability to pass under road bridges or railroad bridges and other fixed constructions, it has been necessary to stow fewer tiers of containers in the forwardly located container bays, which can be clearly seen in Figs. 1 and 2.

The bridge of a ship is the room or platform from which the ship can be controlled or commanded. When a ship is underway the bridge is manned by an OOW (officer of the watch) aided usually by an AB (able seaman) acting as lookout. During critical manoeuvres the captain will be on the bridge supported, perhaps, by an OOW as an extra set of hands, an AB on the wheel and sometimes a pilot if required.

The bridge is located on its own superstructure for ships of the so-called twin island design as shown in Fig. 1 and the bridge is combined with the funnel(s) for the engine(s) in the so-called single island design as shown in Fig. 2. The length and space occupied by the superstructure of the bridge and the superstructure of the funnels or by the combined superstructure cannot be used for stowing containers.

US5751344 discloses an aid for marine navigation includes a low-light video camera mounted within a weather-proof enclosure on a vantage point of a marine vessel for improved night vision. A conventional video camera is also mounted with the low-light video camera for daytime viewing. Video signals from the cameras are automatically selected depending on light conditions for transmission to a cabin of the vessel. Motors rotate the housing in a horizontal plane and in a vertical plane for enabling remote-controlled aiming of the cameras from the helm of the marine vessel. Sensors provide information on azimuth and elevation of the cameras for overlaying the video signal transmitted from the camera housing with this information for display with the video image on a monitor near the helm. Information on longitude and latitude, as well as vessel velocity and direction, from a global satellite positioning system receiver is also displayed. The overlayed video signal is RF modulated on to a predetermined channel for distribution to television receivers in other locations on the vessel.

SUMMARY

It is an object of the invention to provide system that overcomes or at least reduces the problems indicated above.

The foregoing and other objects are achieved by the features of the independent claims. Further implementation forms are apparent from the dependent claims, the description and the figures.

According to a first aspect, there is provided a container ship configured for stowing a plurality of shipping containers above the open deck, the container ship comprising: at least one digital video camera arranged to capture an image stream of a viewing field of view forward of the forward of bow of the container ship, the at least one digital video camera being placed on the container ship such that the view of the at least one digital video camera of the viewing field forward of the container ship is substantially unobstructed by any part of the container ship, and a bridge provided with: instruments for direction control, instruments for engine control, and at least one display screen coupled to said at least one digital video camera for real time reproduction of the image steam captured by said digital video camera.

By providing a container ship with at least one digital video camera arranged to capture a field of view forward the bow of the container ship and by displaying the images captured by the video camera on a display screen or the like on the bridge it becomes possible to locate the bridge anywhere in the container ship, even in a location where there is no outside view you to the outside, and allow the crew of the container

ship to control/command the container ship from the bridge. Being able to place the bridge at any desired location on the container ship while still providing the required visual and possibly this information allows the flow area of the open deck to be used for stowing containers without the height of the containers stowed above deck being limited by a line of sight from a conventional bridge to the sea surface forward of the bow. These new possibilities allow a significant increase in the number of containers that can be stowed on a container ship of a given size.

In a first possible implementation form of the first aspect the bridge is not provided with any windows that provide a view of the area ahead of the container ship.

In a second possible implementation form of the first aspect the at least one digital video camera is arranged such that it provides a field of view to the sea surface forward of the bow of the container ship that starts at a distance that is less than the lesser of two ship lengths or 500 m forward of the container ship.

In a third possible implementation form of the first aspect the said at least one digital video camera is arranged such that it provides a field of view to the sea surface forward of the bow of the container ship that starts at a distance that is less than the lesser of two ship lengths or 500 m forward of the bow to at least 10° on either side under all conditions of draught, trim and containers stowed on deck.

In a fourth possible implementation form of the first aspect

the at least one digital video camera is placed on the container ship such that the view of the at least one digital video camera to the viewing field forward of the container ship is not obstructed either by any containers stowed on the open deck of the container ship.

In a fifth possible implementation form of the first aspect the container ship is configured for storage of shipping containers above the open deck arranged in a plurality of bays distributed over the length of the container ship, arranged in a plurality of rows distributed over the width of the container ship and arranged in a plurality of tiers in the direction of the height of the container ship, with the at least one digital video camera being arranged such that it provides for an unobstructed view of the area ahead of the container ship regardless of the number of tiers of shipping containers that are stowed in the most forwardly located bays.

In a sixth possible implementation form of the first aspect the container ship is provided with one or more of digital video cameras for providing a substantially 360° horizontal field of view/vision around the container ship, the bridge preferably being provided a plurality of display screens that are arranged in a substantially circular or polygon arrangement for real time reproduction of the substantially 360° horizontal field of view to a crew member on the bridge inside the circular or polygon arrangement.

In a seventh possible implementation form of the first aspect the container ship is provided with one or more digital video cameras for providing a substantially 360° horizontal field

of view and a 180° vertical view and said bridge is provided with a display arrangement with a plurality of screens arranged on a semi-sphere covering said bridge.

In an eighth possible implementation form of the first aspect the container ship is provided with a plurality of microphones arranged for capturing sound around the container ship and wherein the bridge is provided with acoustical transducers for real time reproduction of the sound captured by the microphones.

In a ninth possible implementation form of the first aspect the container ship is provided with a plurality of microphones arranged for directional capturing of sound around the container ship wherein the bridge is provided with acoustical transducers for real time reproduction of the directional sound captured by the microphones in a way that allows a crew member on the bridge to determine from which direction the recorded sound came.

In a tenth possible implementation form of the first aspect the container ship is provided with sound processing equipment coupled to the microphones and configured to determine the distance to the source of sound captured with the microphones, the bridge preferably being provided with an instrument or display screen to indicate the distance to the source of sound.

In a eleventh possible implementation form of the first aspect the container ship is provided with a maneuvering console, the maneuvering console preferably comprising one or more of

the following instruments: a steering wheel for controlling the rudder, handles for controlling the engine power, an indicator for the propeller speed, am indicator for the direction of rotation of the propeller, an indicator of the rudder angle, an indicator of the speed of the container ship, a compass.

In a twelfth possible implementation form of the first aspect, wherein the bridge is located below the open deck.

In a thirteenth possible implementation form of the first aspect the container ship is configured for stowing shipping containers above the open deck up to a predetermined maximum height, and wherein the bridge is located below the predetermined maximum height.

In a fourteenth possible implementation form of the first aspect the container ship is configured for stowage of containers a maximum number tiers above the open deck, resulting in the a predetermined maximum height.

In a fifteenth possible implementation form of the first aspect the at least one digital video camera is 3D video camera, such as a dual video camera or a stereo video camera, and wherein said at least one display screen is preferably configured to display 3D video according to a second aspect, there is provided a method of commanding a container ship, the method comprising providing a real-time view of the area ahead of the container ship on a display screen on a bridge of the container ship and issuing directional and/or engine control commands from the bridge.

In a sixteenth possible implementation form of the first aspect the container ship is provided with a radar for detecting the wave systems ahead of the container ship.

According to a second aspect there is provided a method of commanding a container ship configured for stowing a plurality of shipping containers above the open deck, the container ship being provided with at least one digital video camera arranged to capture an image stream of a viewing field of view forward of the bow of the container ship, the at least one digital video camera being placed on the container ship such that the view of the at least one digital video camera of the field forward of the container ship is substantially unobstructed by any part of the container ship, the container ship being provided with a bridge comprising instruments for direction control, instruments for engine control and a display screen, the method comprising displaying a real-time view of the area ahead of the container ship captured with the digital video camera on the display screen on the bridge, and issuing directional and/or engine control commands from the bridge taking into account the a real-time view of the area ahead of the container ship displayed on the display screen.thethethethe.

In a first possible implementation form of the second aspect a crew member on the bridge observing the display screen and a crew member issuing the directional and/or engine control commands from the bridge.

In a second possible implementation form of the second aspect the bridge is not provided with any windows that allow a crew member on the bridge a view of the area ahead of the container ship.

In a third possible implementation form of the second aspect the method comprises capturing a substantially 360° horizontal view around the container ship and reproducing the captured substantially 360° horizontal view on a display screen or array of display screens surrounding an area of the bridge, the area preferably being provided with a maneuvering console.

In a fourth possible implementation form of the second aspect the method comprises capturing sound around the container ship and reproducing the captured sound with at least one acoustical transducer on the bridge.

In a fifth possible implementation form of the second aspect the sound is captured directionally, preferably 360° horizontal around the container ship, and wherein the captured sound is reproduced through a plurality of spatially distributed acoustic transducers on the bridge such that a crew member on the bridge can determine from which direction the recorded sound came.

In a sixth possible implementation form of the second aspect the method comprising capturing video with depth information of the area ahead of the bow of the container ship and displaying the captured video with depth information in 3D on said at least one display screen on said bridge.

These and other aspects will be apparent from and the embodiment(s) described below.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following detailed portion of the present disclosure, the aspects and implementations will be explained in more detail with reference to the example embodiments shown in the drawings, in which:

Fig. 1 is a side view of a prior art container ship of the so-called twin island design;
Fig. 2 is a side view of a prior art container ship of the so-called single island design,
Fig. 3 is a stern view of the container ship of Fig. 2,
Fig. 4 is a stern view of a container ship according to a first embodiment,
Fig. 5 is a side view of the container ship of Fig. 4,
Fig. 6 is a diagrammatic top view of the container ship of Fig. 4 showing a video camera arrangement,
Fig. 7 is a diagrammatic top view of the container ship of Fig. 4 showing a microphone arrangement,
Fig. 8 is a top view of a bridge of the container ship of the first embodiment of Fig. 4,
Fig. 9 is an elevated view of a part of the bridge of Fig. 8,
Fig. 10 is a block diagram of the system of the container ship of the embodiment of Fig. 4, and
Fig. 11 a side view of another embodiment of the container ship.

DETAILED DESCRIPTION

Figs. 1 and 3 show a prior art, i.e. conventional container ship 1, i.e. a ship that is suitable for stowing and transporting a large number of shipping containers, in a side view and stern view, respectively.

The container ship 1 comprises a hull 2 that extends over the full length of the container ship 1 between the bulbous bow 7 and the stern 8. The hull 2 houses one or more engine rooms, fuel tanks and other facilities required for the operation of the container ship 1. A major part of the hull 2 is used for stowing containers as shown by the cutaway view 11. The container ship 1 is provided with one or more large compression-ignited internal combustion engines for propulsion, i.e. four-stroke or two-stroke compression-ignited combustion engine(s) driving the propellers(s) 9 and there will be one or more auxiliary engines (generator sets) that provide electrical power and heat for various consumers of electrical power and heat aboard the container ship 1. One or more rudders 10 provide for directional control of the container ship 1.

The large ocean going cargo ship 1 is provided with a bridge 3 and one or more funnels 4. In the embodiment of figure 1 the superstructure of the bridge 3 is separate from the superstructure of the funnels 4, and therefore the design of this type of container ship 1 is called “twin island”.

The bridge 3 is provided with windows for a view to the outside and with a maneuvering console with instruments and controls for commanding be container ship 1.

A foremast 6 is provided at the bow 7 and a radar mast 5 is placed on top of the bridge 3 for carrying the radar antenna 19. An open deck 20 forms the top of the hull 2.

Containers are stowed inside the hull 2 and on the open deck 20 in a plurality of bays 12 distributed over the length of the container ship 1. The stowed containers are arranged in a plurality of rows 15 distributed over the width of the container ship 1 and arranged in a plurality of tiers 14 in the direction of the height of the container ship 1. The bays 12 are separated by lashing bridges 13. The lashing bridges extend approximately 4 tiers high and serve to secure the containers by lashing.

Fig. 3 is a side view of another prior art container ship that is similar to the container ship of Fig. 1, except that the container ship 1 of Fig. 2 is of the so-called single island design in which the bridge 3 and the funnel 4 are a combined structure. Since the funnel 4 has to be placed close to the main engine and since the main engine has to be close to the propeller 9 the bridge 3 of the single island design needs to be placed closer towards the stern 8 than to the bow 6, when compared to the twin island design of Fig. 1.

In the prior art container ships the crew accommodation (not shown) is typically provided in one of the superstructures.

Maritime regulations require that the view of the sea surface from the navigating and maneuvering workstation, i.e. from the bridge 3, shall not be obscured by more than two ship lengths L, or 500 m, whichever is the less, forward of the bow to 10° on either side under all conditions of draught, trim and deck cargo, e.g. containers. On a container ship 1 the fulfillment of this criterion depends on the height of the bridge 3, the longitudinal position of the bridge 3 and the height the stack of containers in the most forwardly located container bays 12, i.e. the number of tiers 14 in most forwardly located container bays 12. This relation is exemplified by the line of sight/visibility S in Figs. 1 and 2, and by the length d of the area of the sea surface forward of the bow that is obscured from view for an observer on the bridge 3. The bridge 3 cannot be placed arbitrarily high, otherwise the container ship 1 is not be able to pass under road- and railway bridges and other fixed constructions above waterways. Therefore, it has been necessary in conventional container ships to operate with fewer tiers 14 of shipping containers in the forwardly located shipping container bays 12, when compared to the more rearwardly located container bays that have up to eight or nine tiers.

Figs. 4 and 5 illustrate a container ship 1 according to a first embodiment in stern view and side view, respectively. The container ship 1 according to the first embodiment is essentially identical to the container ship of Figs. 1 and 2, with the following exceptions.

The conventional bridge 3 has been removed and replaced by a bridge 18 that is not located on the top of a superstructure.

Instead, the bridge 18 is located inside the superstructure that also houses the funnel 4 and supports the radar mast 5 with the radar antenna 19 but it is noted that the bridge 18 could just as well be located inside the hull 2. Thus, the bridge 18 is placed above the open deck 20 at a height that is lower than the maximum height of containers stowed on the open deck 20 or the bridge 18 is placed below the open deck 20. In the first embodiment the bridge 18 is shown inside the superstructure together with the funnel 4, and the bridge 18 is indicated by a dotted line because the bridge 18 does not have and does not need to have any windows to the open and the bridge 18 is therefore not visible from the outside.

The crew accommodation (not shown) is preferably placed in the superstructure.

The container ship 1 is provided with a digital video camera 22 that is arranged to capture images (video) of the field of view forward of the bow 7. This digital video camera can be a 3D camera or a conventional 2D camera. In an embodiment the digital video camera operates in the visible spectrum, but it is also possible to operate with a camera outside the visible spectrum (such as an infrared or night vision camera) or with a camera that operates both inside visible spectrum and outside the visible spectrum.

In an embodiment the digital video camera is installed at or near the top of the foremast 6, a position that provides for an unhindered view of the sea surface forward of the bow 7 regardless of the height of the containers stowed on the open deck 20. In Fig. 6 a possible angle of view and a vertical

direction for the digital video camera 22 at the bow 7 is indicated, preferably the digital video camera has a relatively wide-angle in the vertical field, e.g. 90° or more so that the length d of the obscured area ahead of the bow 7 is short and at the same time the good view in the higher area is provided. The horizontal field of view of the digital video camera 22 should preferably be relatively wide, with an angle of view Zb that is preferably above 180°, even more preferably at least 225°, as illustrated in Fig. 6.

As illustrated in Fig. 6, the container ship 1 can be provided with another digital video camera 22 at the stern 8 that is configured to capture images (video) of the field of view rearward of the stern 8. Preferably, the digital video camera 22 at the stern 8 is also a wide angle video camera, as illustrated by the horizontal angle of view Zs. Further, the container ship one can be provided with a port side digital video camera 22 that is configured to capture images (video) of the field of view to the port side of the container ship 1. The port side digital video camera 22 is preferably also a wide-angle camera, as illustrated by the angle Zp. A wide-angle star board video camera 22 can also be provided, as illustrated by the wide-angle Zsb. The four digital video cameras 22 form together a camera arrangement that provides a 360° horizontal field of view around the container ship 1.

In the present embodiment the arrangement comprises four cameras, but it is understood that a single camera with a 360° horizontal view could be used instead of a plurality of

cameras with a combined view of 360°. A larger number of cameras can also be used to provide a camera arrangement with a 360° horizontal view around the container ship 1.

Fig. 7 is a diagrammatic top view of the container ship 1 illustrating a microphone arrangement for picking up sounds around the container ship 1, such as e.g. sound signals and fog horn from other ships. The container ship 1 is provided with several microphones 24, preferably directional microphones 24 that are positioned along the periphery of the container ship 1 in order to pick up sound in a 360° field of hearing. In Fig. 7 an array with six microphones 24 is shown. The interrupted lines illustrate the hearing angle of each of the microphones 24. However, it is understood that any number of microphones 24 can be used, such as for example a single 360° microphone that is placed centrally on the container ship 1 or an arrangement including more than six directional microphones 24.

Fig. 8 is a top view of the bridge 18 and the Fig. 9 is an elevated view of a portion of the bridge 18. The bridge 18 is provided with an, as such, conventional maneuvering console 21 with the usual instruments of a conventional bridge, such as a steering wheel 26, display screens 28 for navigation and RADAR, control knobs 23 for setting of various equipment, handles (telegraph) 29 for controlling the load and speed of the main engine(s) and gauges 34 displaying various measured parameters/properties. The maneuvering console 21 is placed at substantially centrally on the bridge and a plurality of

display screens 25 is arranged circumferentially around the maneuvering console 21.

Loudspeakers 27 are spatially distributed so as to be placed circumferentially around the maneuvering console 21.

Fig. 10 is a block diagram of system on the bridge 18 and the equipment connected thereto. The system includes an electronic control unit 50 that is connected to RADAR, SONAR, LIDAR (laser scanning), a position system (GPS), a rudder sensor, engine sensors, to ECDIS (Electronic Chart Display and Information System), the digital video cameras 22, the directional microphones 24, IAS (Automatic Identification System), VDR (wage data recorder), the maneuvering console 21, the loudspeakers 27, the display screens 25, wireless communication device(s) 52, propeller speed and pitch sensor, vessel speed and direction sensor and compass 33. The connection between the electronic control unit 50 and these devices/instruments can be wired, e.g. via signal cables or wireless.

The electronic control unit 50 is configured to display the information received from the connected sensors and devices on the instruments, display screens 28, gauges 30 of the maneuvering console.

The bridge 18 may also be provided with further instruments, display screens and gauges (is not shown) that are located on the bridge but not on the maneuvering console, such as overhead instrumentation (not shown) and instrumental other consoles (not shown) on the bridge 18.

Further, the bridge 18 can be provided with information on maneuvering characteristics of the container ship 1; these include propeller speed in RPM and the container ship's speed in knots corresponding to full, half, slow, and dead slow ahead positions on the telegraph. The compass 33 can be a standard magnetic compass, steering magnetic compass, or gyrocompass or combination thereof.

The steering wheel 26 may operate a telemotor transmitter. Rudder angle indicators are provided on the maneuvering console 21. The bridge 18 can be provided with weather monitoring systems and with an automatic identification system (ASI), i.e. a system to transmit/receive the information on ships', name, position, course, speed, destination, cargo etc. by digital radio technology to ships in the area of the potential 1. The bridge 18 may also be provided with ARPA: Automatic Radar Plotting Aid displays the position of the container ship 1 and other vessels nearby.

The RADAR displays the position of the ships in the vicinity and selects the course for the vessel by avoiding any kind of collision. The container ship 1 may also be provided with an echo Sounder (SONAR): an instrument is used to measure the depth of the water below the container ship's bottom using sound waves. The container ship can also be provided with a GPS Receiver, or similar receiver for another satellite-based positioning system: to determine the container ship's location with the help of positioning satellites in the earth's orbit.

The electronic control unit 50 is in receipt of the signal from the digital video cameras and the electronic control unit 50 comprises, or has associated therewith, an image processing unit or image processing software for processing the signals captured from the array of video cameras in order to present the visual information captured by the array of video cameras on the array of display screens 25. Further, the display screens are configured to provide depth information, i.e. 3D video. The image processing unit/processing software is configured such that a crew member on the bridge, e.g. position near the maneuvering console will have a 360° view of the surroundings of the container ship by looking at the array of display screens 25 around him/her. Preferably, the bridge is oriented in a similar way to a conventional bridge with the display screens 25 on the opposite side of the maneuvering console 21 relative to the steering wheel 26 displaying a view of the area ahead of the container ship 1, the display screens on the side of the maneuvering console 21 that is provided with the steering wheel 26 displaying the area behind the container ship 1, the display screen(s) 25 on the star board side of the maneuvering console 21 displaying the star board view and the display screen(s) 25 on the port side of the maneuvering console displaying the port side view captured by the camera arrangement.

The display screens 25 can be part of a pair of glasses (not shown), worn the crew member on the bridge 18. The pair of glasses is preferably capable of displaying 3D video of the video captured by the cameras 22. The glasses preferably include a sensor that detects the orientation in which the

glasses are directed and an electronic controller connected to the glasses is configured to display the field of view captured by the camera arrangement corresponding to the orientation of the glasses, so that the crew member wearing the glasses will e.g. be presented with the forward view captured by the camera arrangement when the glasses are directed in the forwardly (relative to the orientation of the container ship 1), be presented with a rearward view captured by the camera arrangement when the classes are directed rearwardly, and so on for the other viewing directions.

The electronic control unit 50 is also provided with a sound processing unit/sound processing software that is configured to process the sounds captured by the array of directional microphones 24. The captured sounds are processed by the sound processing unit/sound processing software in such a way that they are reproduced by the loudspeakers 27 in a spatial manner, so that the crew member on the bridge will be able to hear from which the direction the sound is coming. The sound processing unit/sound processing software is configured to determine the distance of the source of a captured sound, and is configured to indicate the distance of the captured sound on instruments on the bridge 18. In order to determine the distance to the captured sound, the electronic control unit 50 is configured to combine information from radar and/or camera array and/or LIDAR and/or, position data in combination with geographical information with the signal from the camera array. The microphones 24 are configured to cover at least the human hearing spectrum, but in an embodiment the microphones 24 cover a broader spectrum and the sound processing unit/software is configured to convert the audio

signal recorded outside the human hearing spectrum to information that can be detected by the crew, for example to information within the hearing spectrum or information represented on instruments or a display screen.

The video captured by the camera arrangement is reproduced on the display screens 25 real time, so that a crew member on the bridge 18 has a real-time 360° view of the surroundings of the container vessel 1. The sound/audio captured by the microphone arrangement is reproduced real-time by the loudspeaker arrangement so that a crew member on the bridge has a real-time spatial audio information of the surroundings of the container vessel 1.

With this audiovisual information the crew on the bridge 18 is well informed in real time about the surroundings of the container ship 1 and therefore fully capable of commanding the container ship 1 from the bridge 18. On top of the visual and audio information of the surroundings of the container ship 1 the crew on the bridge 18 is information from other sources such as RADAR, LIDAR, SONAR and GPS. The crew on the bridge 18 has the required instrumentation, in the form of the maneuvering console, for commanding the container ship 1. Directional controls (rudder) and engine power can be controlled directly from the bridge 18. Consequently, the bridge 18 does not need to be provided with any windows that provide a view to the outside, thus allowing the bridge 18 to be located in the container ship 1 without the need for the bridge to be located above the containers stowed on the open deck 20. It is therefore an advantage of the container vessel according to this disclosure that the forwardly located

container bays can be stowed with eight or nine tiers of containers without detrimental effect on the forward visibility for the crew on the bridge 18.

In an embodiment, not shown the container ship provided with the camera arrangement providing a substantially 360° horizontal field of view and a substantially 180° vertical view and the bridge 18 is provided display arrangement with a plurality of screens arranged on a semi-sphere covering the bridge 18.

In an embodiment the VDR is configured to record the video captured by the cameras 22 or at least the video displayed on the display screens 25 and/or the sound recorded by the microphones 24 or at least the sound reproduced by the loudspeakers 27.

In an embodiment the container ship 1 is provided with a wave radar (not shown) for detecting the wave systems ahead of the container ship 1. The wave radar provides information for a navigator on the bridge 18 or other crew member via e.g. a display screen on the bridge 18 to judge if ship speed should be reduced in order to ensure safe navigation. The wave radar judges significant wave height (which is the measure used to characterize sea state) on a statistical basis, which is better (more precise) that a judgment by human eye, be it a human eye observing the wave system directly or via a video camera and display screen.

In an embodiment the cameras 24, the connection between the cameras 24 and the bridge 18, the microphones 24 and the

bridge equipment such as the display screens 25 and the electronic equipment for controlling an coordinating, such as the electronic control unit 50 are provided on the container vessel 1 at least twice for redundancy, so that the crew on the bridge 18 will still have access to the visual and audio information should one of these systems inadvertently fail. In an embodiment the electronic control unit 50 uses augmented reality is to display (overlay) the approx. origin and distance of a source of a sound on one or more of the display screens, e.g. in the form if a circle and a line from the container ship 1 the area indicating the distance to the source of sound. The overlay is preferably applied to a navigational map and/or radar plot.

Fig. 11 shows a container ship according to a second embodiment that is essentially identical to the container ship of the first embodiment with the difference that the bridge 18 is located in the hull 2, i.e. below the open deck 20 and the space next to the funnel 4 is used to a container bay on each side of the funnel, thereby further increase the container stowing capacity of the container ship 1.

The invention has been described in conjunction with various embodiments herein. However, other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. In the claims, the word “comprising” does not exclude other elements or steps, and the indefinite article “a” or “an” does not exclude a plurality. A single processor or other unit may fulfill the functions of several items recited in

the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measured cannot be used to advantage.

The reference signs used in the claims shall not be construed as limiting the scope.

Patentkrav

1. Containerskib, der er indrettet til at stuve et antal skibscontainere over det åbne dæk, hvilket containerskib omfatter:

mindst ét digitalt videokamera, der er anbragt til at opfange en strøm af billeder af et synsfelt af en udsigt fremad for boven af containerskibet, hvor det nævnte mindst ene digitale videokamera er anbragt på containerskibet, således at udsigten for det mindst ene digitale videokamera af synsfeltet fremad for containerskibet er i det væsentlige uhindret af nogen del af containerskibet og

en bro, der er tilvejebragt med:

instrumenter til styring af retning,

instrumenter til styring af motor, og

mindst en skærm, der er koblet til det nævnte mindst ene digitale videokamera for i realtid at gengive billedstrømmen, der er opfanget af det nævnte digitale videokamera.

2. Containerskibet ifølge krav 1, hvor den nævnte bro ikke er tilvejebragt med eventuelle vinduer, der giver en udsigt over området foran containerskibet.

3. Containerskib ifølge krav 1 eller 2, hvor det nævnte mindst ene digitale videokamera er anbragt således, at det tilvejebringer et synsfelt mod havoverfladen fremad for boven af containerskibet, der starter i en afstand, som er mindre end den mindste af to skibslængder eller 500 m fremad for containerskibet.

4. Containerskibet ifølge krav 3, hvor det nævnte mindst ene digitale videokamera er anbragt således, at det tilvejebringer et synsfelt mod havoverfladen fremad for boven af containerskibet, der starter i en afstand, som er mindre end den mindste af to skibslængder eller 500 m fremad for boven til mindst 10° på begge sider under alle forhold af dybgang, trim og containere, der er stuvet på dæk.

5. Containerskib ifølge et hvilket som helst af kravene 1 til 4, hvor det nævnte mindst ene digitale videokamera er anbragt på containerskibet, således at udsigten for det mindst ene digitale videokamera i synsfeltet fremad for containerskibet heller ikke er obstrueret af containere, der er stuvet på det åbne dæk af det nævnte containerskib.

6. Containerskib ifølge et hvilket som helst af kravene 1 til 5, hvor det nævnte containerskib er indrettet til at opbevare skibscontainere over det åbne dæk, der er anbragt i et antal lastrum, som er fordelt over længden af containerskibet, og som er anbragt i et antal rækker, der er fordelt over containerskibet bredde og anbragt i et antal lag i retningen af containerskibets højde, hvilket nævnte mindst ene digitale videokamera er anbragt således, at det tilvejebringer en uhindret udsigt over området foran containerskibet uanset antallet af lag af skibscontainere, der er stuvet i de lastrum, der er placeret længst fremme.

7. Containerskib ifølge et hvilket som helst af kravene 1 til 6, der er tilvejebragt med et eller flere digitale videokameraer for at tilvejebringe et i det væsentlige 360° horisontalt synsfelt omkring containerskibet, hvor den

nævnte bro fortrinsvis er tilvejebragt med et antal skærme, der er anbragt i et i det væsentlige cirkulært eller polygonalt arrangement for i realtid at gengive det nævnte i det væsentlige 360° horisontale synsfelt til et besætningsmedlem på den nævnte bro inden i det nævnte cirkulære eller polygonale arrangement.

8. Containerskib ifølge et hvilket som helst af kravene 1 til 6, der er tilvejebragt med et eller flere digitale videokameraer for at tilvejebringe et i det væsentlige 360° horisontalt synsfelt og en 180° lodret udsigt, og hvilken nævnte bro er tilvejebragt med et displayarrangement med et antal skærme, der er arrangeret på en halvkugle, som dækker broen.

9. Containerskib ifølge et hvilket som helst af kravene 1 til 8, der er tilvejebragt med et antal mikrofoner, som er indrettet til at fange lyd omkring containerskibet, og hvor den nævnte bro er tilvejebragt med akustiske transducere til i realtid at gengive lyden, der er opfanget af mikrofonerne.

10. Containerskib ifølge et hvilket som helst af kravene 1 til 9, der er tilvejebragt med et antal mikrofoner, som er indrettet til retningsbestemt at opfange lyd omkring containerskibet, hvor den nævnte bro er tilvejebragt med akustiske transducere til i realtid at gengive den retningsbestemte lyd, der er opfanget af de nævnte mikrofoner, på en måde, der gør det muligt for et besætningsmedlem på den nævnte bro at bestemme, fra hvilken retning den optagne lyd kom fra.

11. Containerskib ifølge krav 9 eller 10, der yderligere er tilvejebragt med lydbehandlingsudstyr, som er koblet til de nævnte mikrofoner og som er indrettet til at bestemme afstanden til lydkilden, der er opfanget med de nævnte mikrofoner, hvilken nævnte bro fortrinsvis er tilvejebragt med et instrument eller skærm til at vise afstanden til den nævnte lydkilde.

12. Containerskib ifølge et hvilket som helst af kravene 1 til 11, der er tilvejebragt med en manøvreringskonsol, hvilken nævnte manøvreringskonsol fortrinsvis omfatter et eller flere af følgende instrumenter: et rat til at styre roret, håndtag til at styre hovedmotorens kraft eller belastning, en indikator for farten af propellerne, en indikator for rorvinklen, en indikator for containerskibets fart og et kompas.

13. Containerskib ifølge et hvilket som helst af kravene 1 til 12, hvor den nævnte bro er anbragt under det åbne dæk.

14. Containerskib ifølge et hvilket som helst af kravene 1 til 12, der er indrettet til at stuve skibscontainere over det åbne dæk op til en forudbestemt maksimal højde, og hvor den nævnte bro er placeret under den forudbestemte maksimale højde.

15. Containerskibet ifølge krav 13, hvilket containerskib er indrettet til at stuve containere i et maksimalt antal lag over det åbne dæk, hvilket resulterer i den nævnte forudbestemte maksimale højde.

16. Containerskib ifølge et hvilket som helst af kravene 1 til 13, hvor det mindst ene digitale videokamera er et 3D-kamera, og hvor den mindst ene skærm er fortrinsvis indrettet til at vise 3D-video.

17. Fremgangsmåde til at kommandere et containerskib, der er indrettet til at stuve et antal skibscontainere over det åbne dæk, hvilket containerskib er tilvejebragt med mindst et digitalt videokamera, der er indrettet til at opfange en billedstrøm af et synsfelt fremad for boven af containerskibet, hvilket mindst ene digitale videokamera er anbragt på containerskibet, således at udsigten for det mindst ene digitale videokamera i synsfeltet fremad for containerskibet er i det væsentlige uhindret af en hvilken som helst del af containerskibet, hvilket containerskib er tilvejebragt med en bro, der omfatter instrumenter til at styre retningen, instrumenter til at styre motoren og en skærm, hvilken fremgangsmåde omfatter i realtid at vise en udsigt af området foran det nævnte containerskib, hvilken udsigt er opfanget med det nævnte digitale videokamera på den nævnte skærm på den nævnte bro, og at udstede en kommando til at styre retningen og/eller motoren fra den nævnte bro under hensyntagen til udsigten i realtid over området foran det nævnte containerskib, der vises på den nævnte skærm.

18. Fremgangsmåden ifølge krav 17, hvilken fremgangsmåde omfatter et besætningsmedlem på den nævnte bro, der observerer den nævnte skærm, og et besætningsmedlem, der udsteder de nævnte kommandoer til at styre retningen og/eller motoren fra den nævnte bro.

19. Fremgangsmåde ifølge 17 eller 18, hvor den nævnte bro ikke er tilvejebragt med eventuelle vinduer, der tillader et besætningsmedlem på den nævnte bro en udsigt over området foran containerskibet

20. Fremgangsmåde ifølge et hvilket som helst af kravene 17 til 19, hvilken fremgangsmåde omfatter at indfange en i det væsentlige 360° horisontal udsigt omkring containerskibet og gengive den indfangede i det væsentlige 360° horisontale udsigt på en skærm eller et array af skærme, der omgiver et område af den nævnte bro, hvilket nævnte område er fortrinsvis tilvejebragt med en manøvreringskonsol.

21. Fremgangsmåde ifølge et hvilket som helst af kravene 17 til 20, hvilken fremgangsmåde omfatter at opfange lyd omkring containerskibet og gengive den opfangede lyd med mindst en akustisk transducer på den nævnte bro.

22. Fremgangsmåden ifølge krav 21, hvor lyden opfanges retningsbestemt, fortrinsvis 360° vandret omkring containerskibet, og hvor den nævnte opfangede lyd gengives gennem et antal rumligt fordelte akustiske transducere på den nævnte bro, således at et besætningsmedlem på den nævnte bro kan bestemme, fra hvilken retning den optagne lyd kom.

23. Fremgangsmåde ifølge et hvilket som helst af kravene 17 til 22, hvilken fremgangsmåde omfatter at indfange en video med dybdeinformation af området foran boven af containerskibet, og at vise den opfangede video med

dybdeinformation i 3D på den mindst ene nævnte skærm på den nævnte bro.

Fig. 1

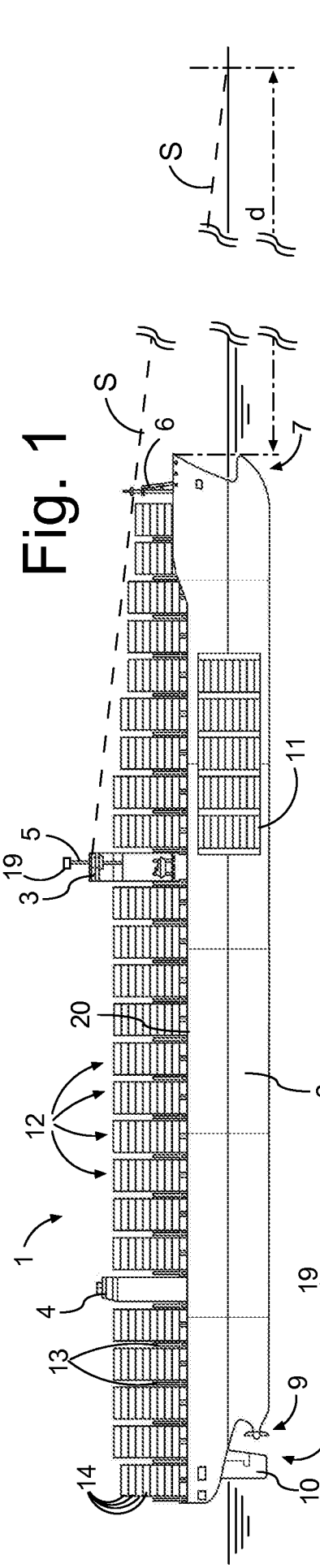


Fig. 2

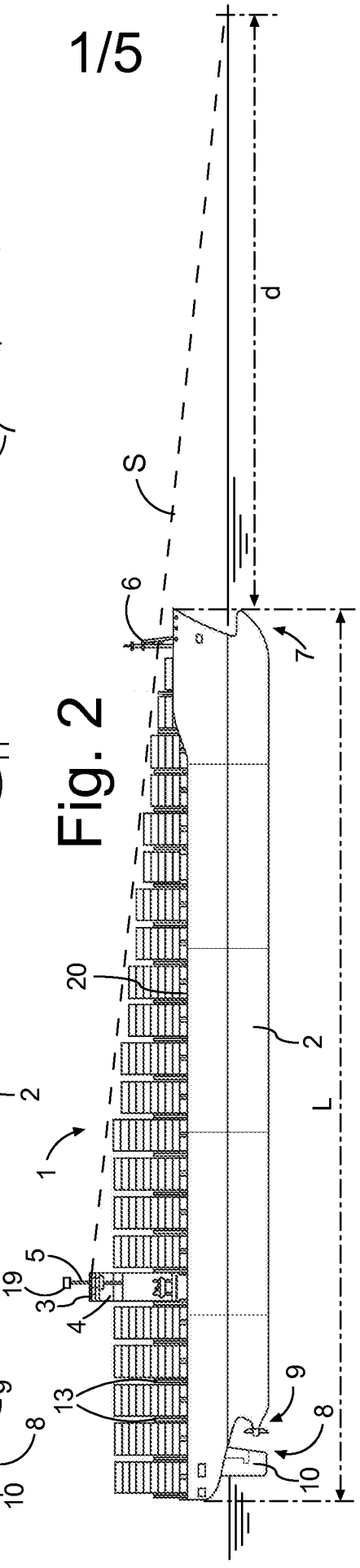


Fig. 4

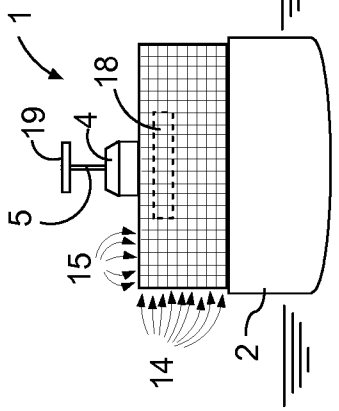


Fig. 3

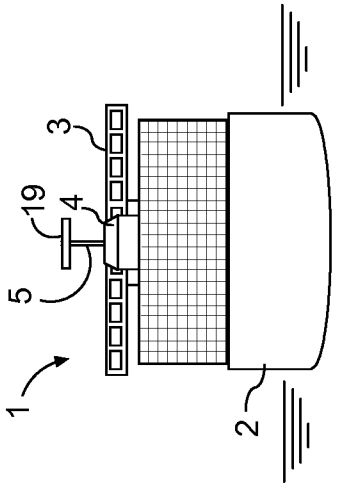


Fig. 5

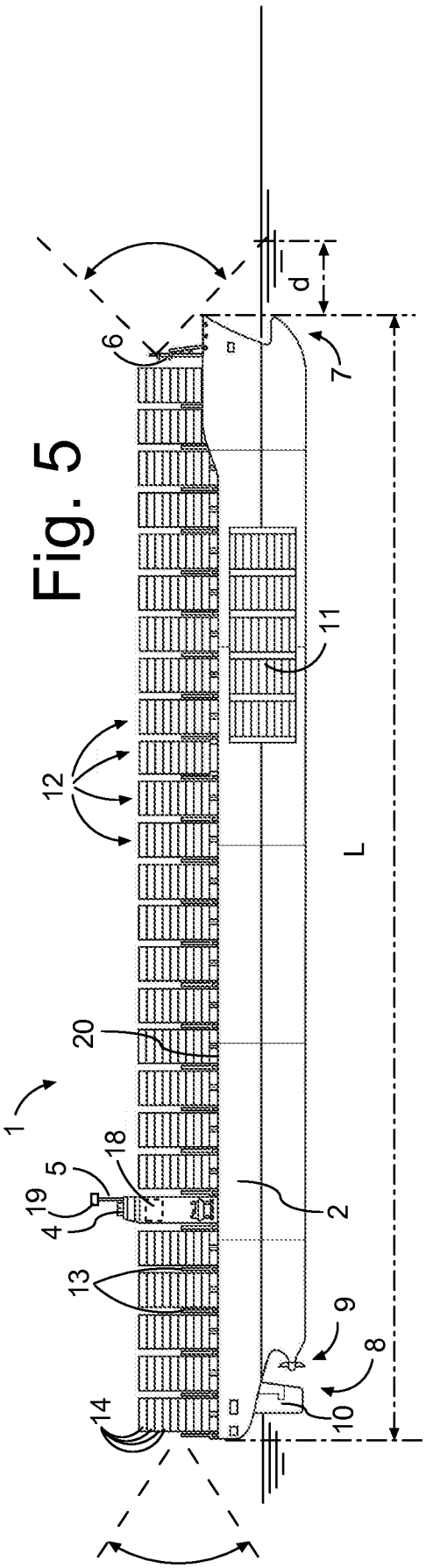


Fig. 6

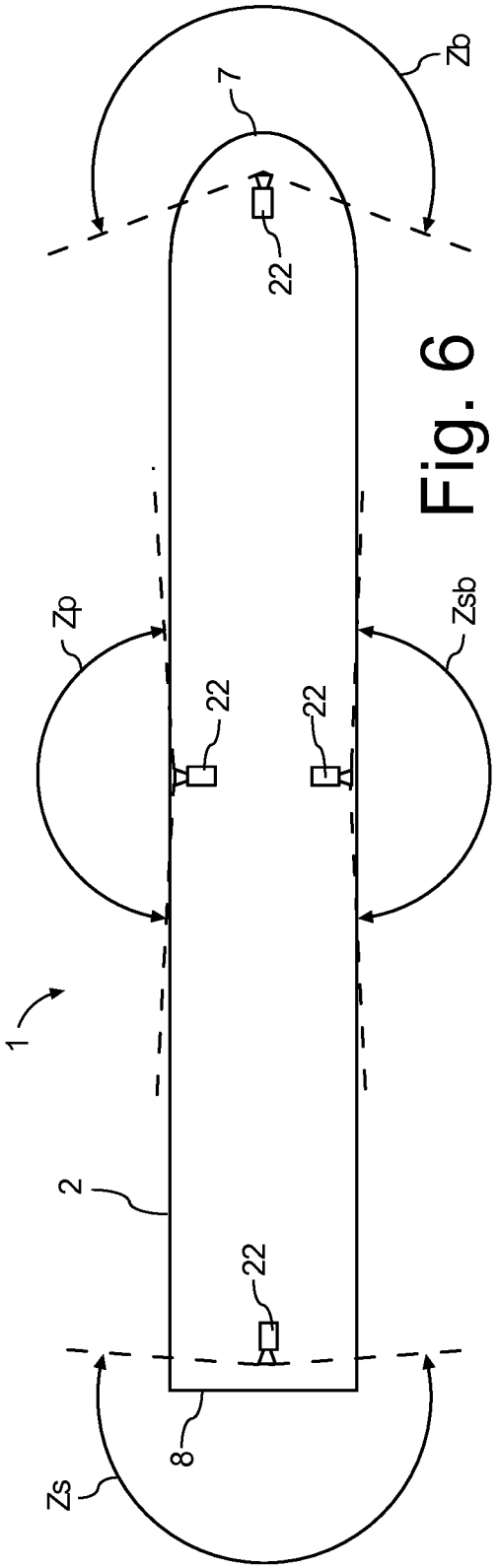


Fig. 7

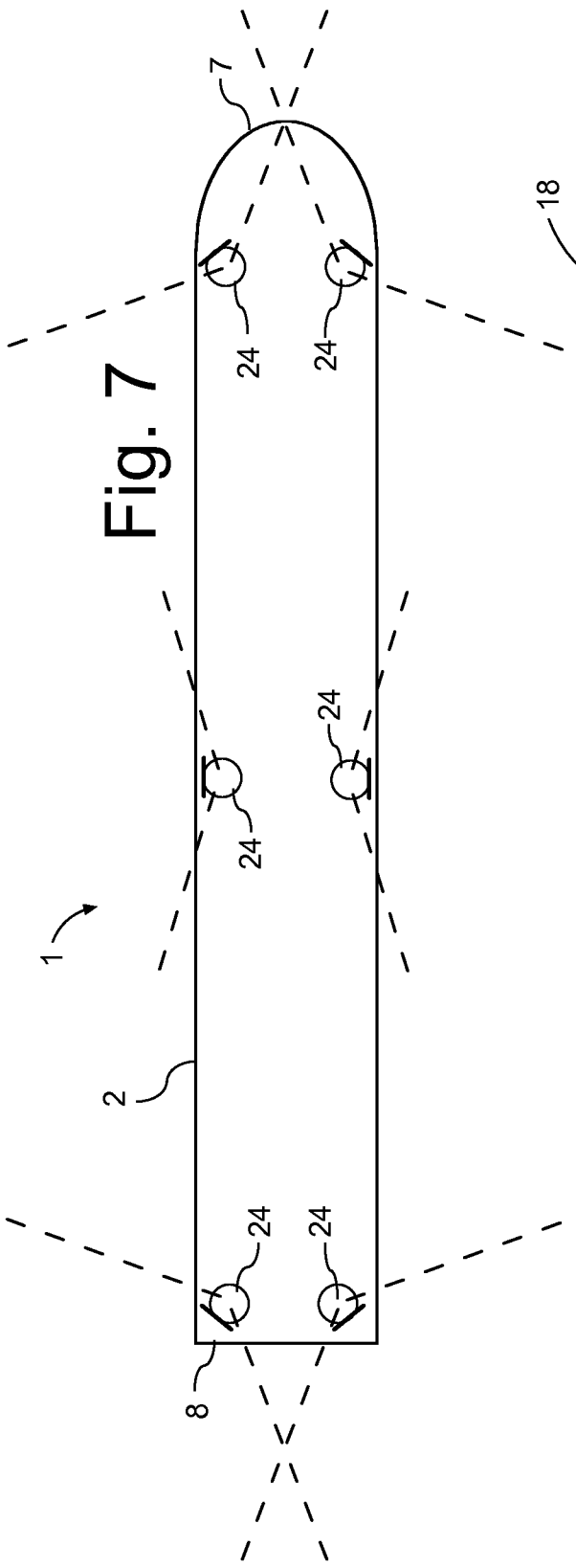

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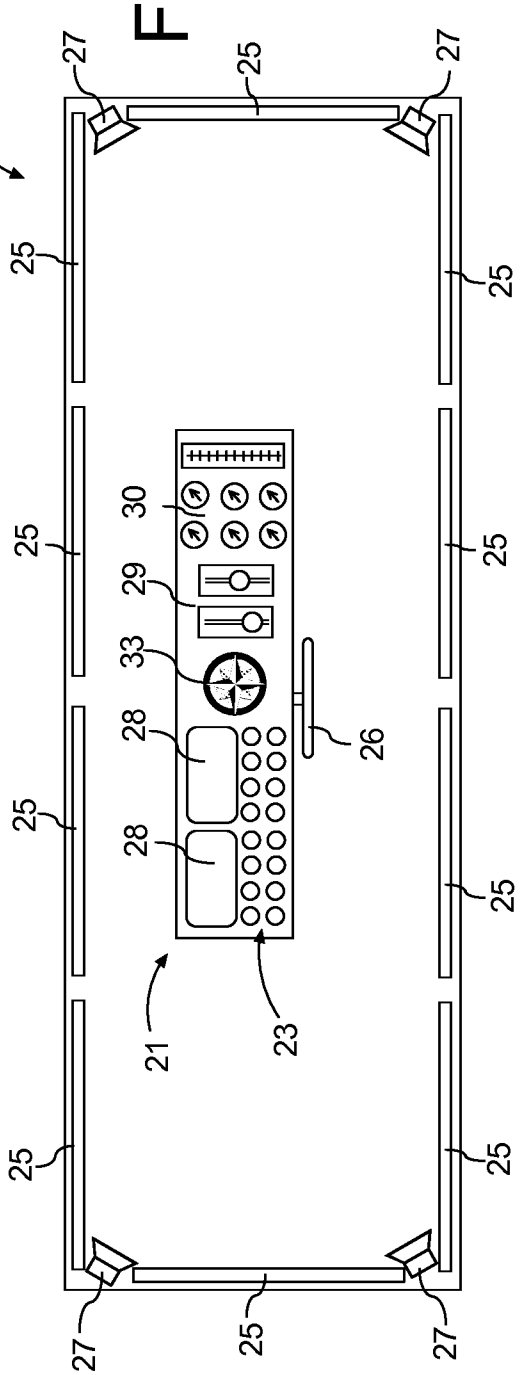
Fig. 8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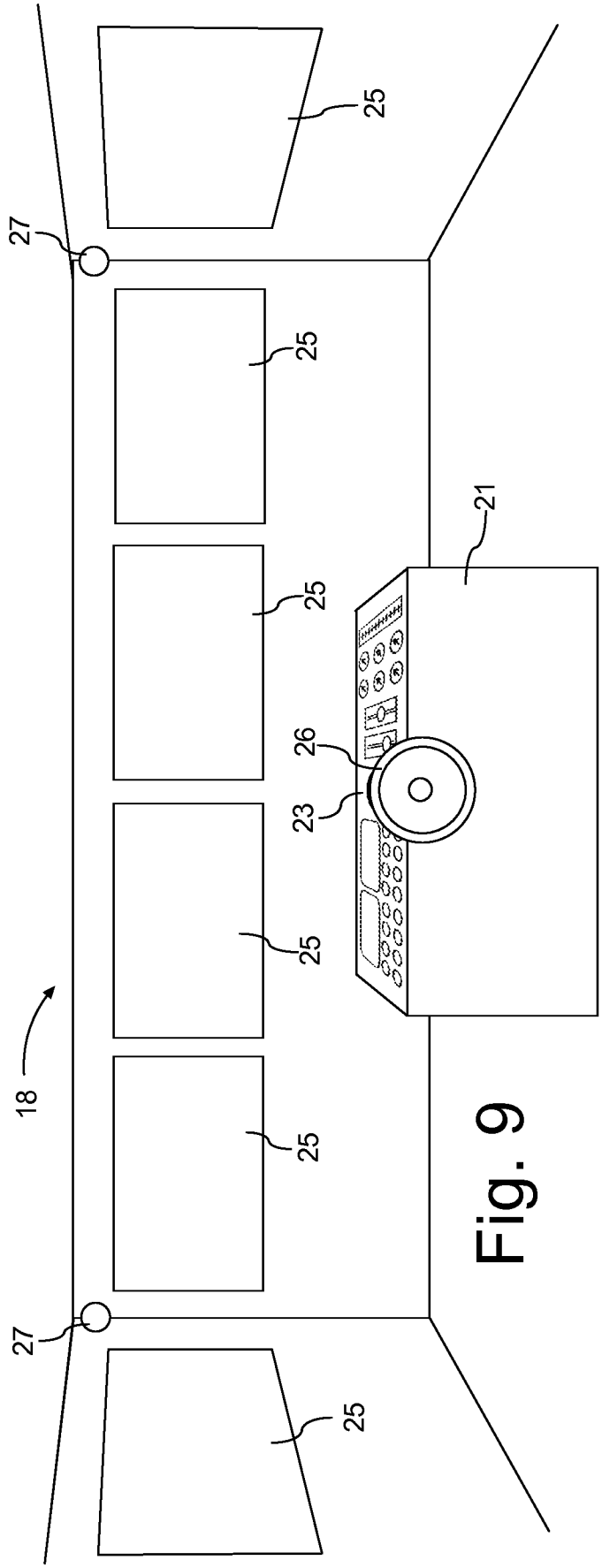


Fig. 9

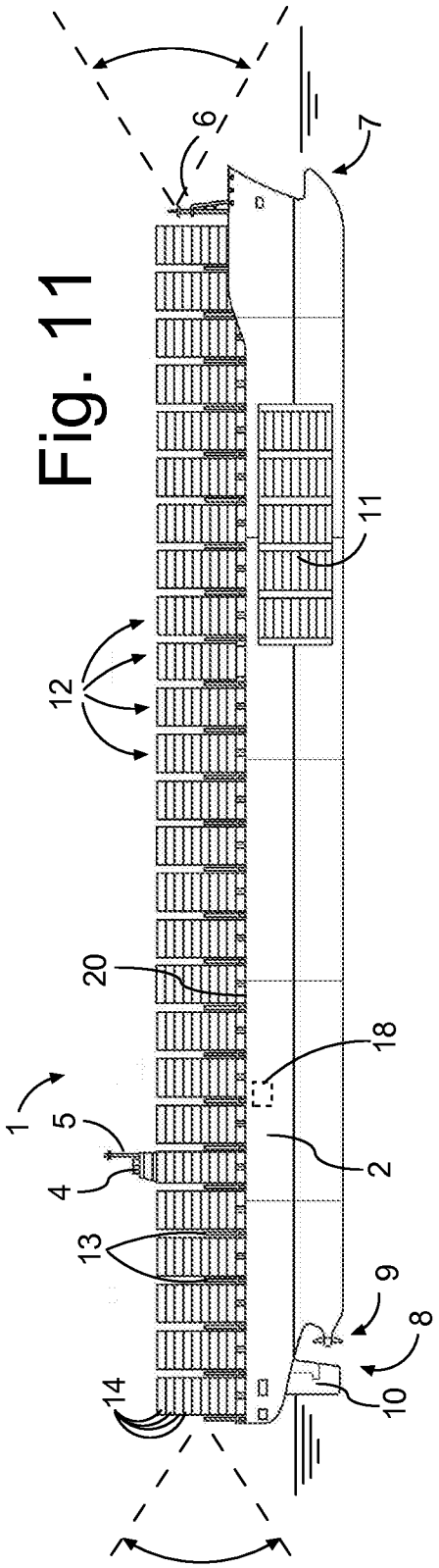
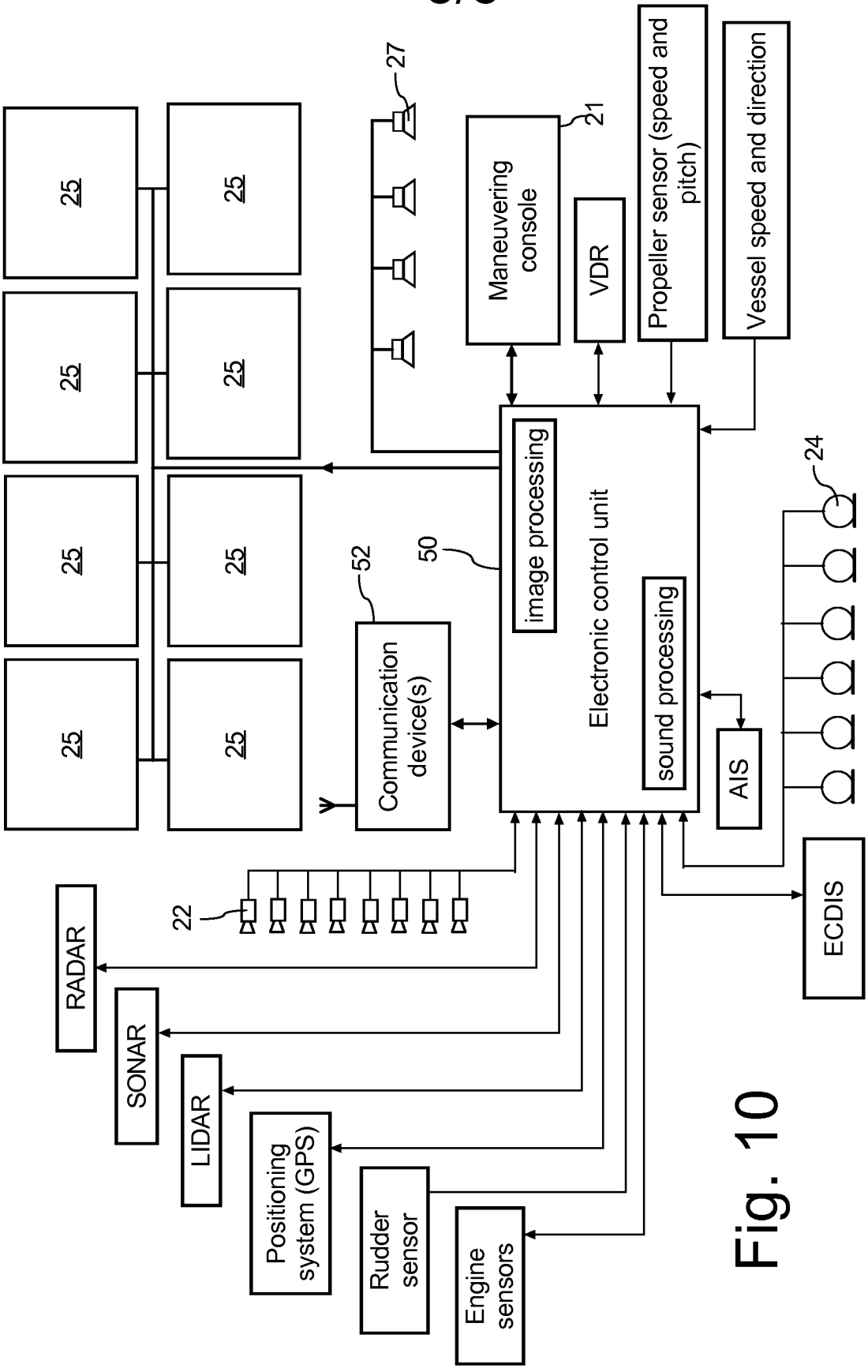


Fig. 11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27
Maneuvering console
21
VDR
Propeller sensor (speed and pitch)
Vessel speed and direction
image processing
Electronic control unit
sound processing
50
52
Communication device(s)
24
AIS
ECDIS
22
RADAR
SONAR
LIDAR
Positioning system (GPS)
Rudder sensor
Engine sensors

Fig. 10

DANISH PATENT AND TRADEMARK OFFICE

SEARCH REPORT - PATENT	Application No. PA 2016 70183

1. ☐ Certain claims were found unsearchable (See Box No. I).

2. ☐ Unity of invention is lacking prior to search (See Box No. II).

A. CLASSIFICATION OF SUBJECT MATTER

B 63 B 15/00 (2006.01); B 63 B 25/02 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

CPC, IPC: B63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

DK, NO, SE, FI: IPC-classes as above.

Electronic database consulted during the search (name of database and, where practicable, search terms used)

EPODOC, WPI, FULL TEXT: ENGLISH

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant for claim No.
X	US 5751344 A (SCHNEE ROBERT ALAN) 1998.05.12. See especially col. 1, lines 44-60 together with figures 1 and 2	1, 17-18
A	DE 20303114U (KABELLA KLAUS) 2003.05.22. See whole document	-
A	WO 2014033109 A1 (ULSTEIN POWER & CONTROL AS) 2014.03.06. See whole document	-
A	WO 2011021079 A1(TECHNOLOGICAL SERVICE S R L et al.) 2011.02.24. See whole document	-

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:	"P" Document published prior to the filing date but later than the priority date claimed.
"A" Document defining the general state of the art which is not considered to be of particular relevance.	"T" Document not in conflict with the application but cited to understand the principle or theory underlying the invention.
"D" Document cited in the application.	"X" Document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone.
"E" Earlier application or patent but published on or after the filing date.	"Y" Document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"L" Document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified).	"&" Document member of the same patent family.
"O" Document referring to an oral disclosure, use, exhibition or other means.	

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Date of completion of the search report
16 January 2017

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SEARCH REPORT - PATENT		Application No. PA 2016 70183
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant for claim No.

SEARCH REPORT - PATENT	Application No. PA 2016 70183

Box No. I Observations where certain claims were found unsearchable

This search report has not been established in respect of certain claims for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched, namely:

2. ☐ Claims Nos.:
because they relate to parts of the patent application that do not comply with the prescribed requirements to such an extent that no meaningful search can be carried out, specifically:

3. ☐ Claims Nos.:
because of other matters.

Box No. II Observations where unity of invention is lacking prior to the search

The Danish Patent and Trademark Office found multiple inventions in this patent application, as follows:

SEARCH REPORT - PATENT	Application No. PA 2016 70183

SUPPLEMENTAL BOX

Continuation of Box [.]