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[21] Appl. No. **736,530**
 [22] Filed **June 12, 1968**
 [45] Patented **Dec. 8, 1970**

[54] **SHIP WITH ICE-BREAKING ATTACHMENT**
 2 Claims, 4 Drawing Figs.

[52] U.S. Cl. 114/41

[51] Int. Cl. **B63b 35/08**
 [50] Field of Search. 114/40, 41,
 42

[56] **References Cited**
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Primary Examiner—Trygve M. Blix
Attorney—Waters, Roditi, Schwartz & Nissen

ABSTRACT: A ship is provided with an icebreaking attachment at the bow thereof, the attachment carrying a vibrating mechanism and being connected to the ship so that they are secured in alignment along a common longitudinal axis while being relatively rotatable about this longitudinal axis as well as about transverse axes, while also being relatively displaceable vertically.

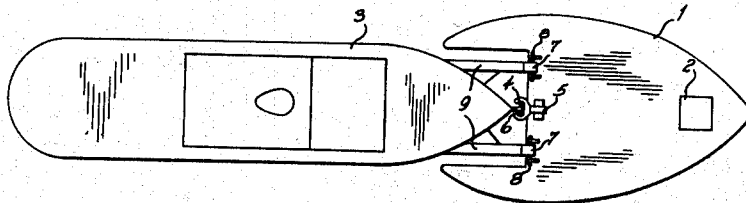


FIG. 1

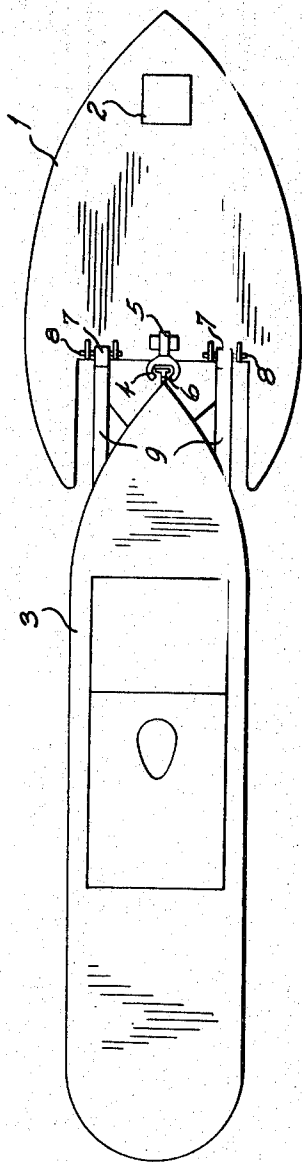


FIG. 2

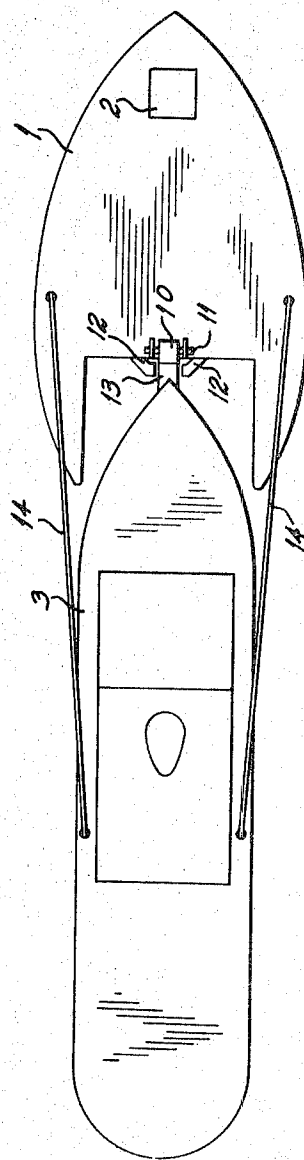


FIG. 3

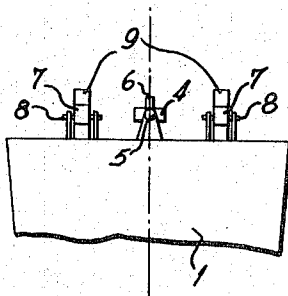
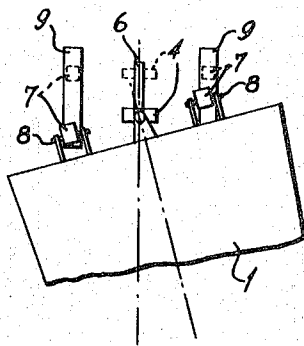


FIG. 4



SHIP WITH ICE-BREAKING ATTACHMENT

This invention relates to water transport and more particularly to ships with icebreaking attachments comprising a vibratory mechanism and employed to crush the ice cover.

Known in the art are ships with icebreaking attachments comprising a vibratory mechanism, said icebreaking attachment being connected to the vessel by means of a resilient element. Due to this arrangement, the vibrations effected in the icebreaking attachment are imparted to the ship, resulting in unfavorable conditions for the crew and impairing the efficiency of operation of the ships equipped with the icebreaking attachments of this type.

An object of this invention is to provide such a ship with an icebreaking attachment comprising a vibratory mechanism in which the connection of the attachment to the ship ensures angular movement of the icebreaking attachment and the ship in relation to their respective fore-and-aft and transverse center lines and linear movement of the vertical axes, thus excluding the possibility of transmission of vibrations from the attachment to the ship.

In accordance with the above-specified and other objects of this invention, in the proposed ship with the icebreaking attachment comprising a vibratory mechanism and installed in front of the ship bow, according to this invention, the connection of the icebreaking attachment to the ship is effected by means of articulated joints which ensure mutual angular movement of the icebreaking attachment and the ship with respect to their own and transverse center lines, and linear movement along the vertical axes.

The articulated connection of the icebreaking attachment to the ship can be obtained by means of a coupling fastened in the stern of said attachment and having an axis of rotation coinciding with the fore-and-aft plane of symmetry of said attachment. According to this arrangement, said coupling interacts with the guide fastened to the ship stem. Additionally, the above-mentioned connection of the icebreaking attachment to the ship is effected by means of two rollers installed in the sides of the stern of the icebreaking attachment and interacting with respectively arranged vertical girders of the ship.

The articulated connection of the icebreaking attachment to the ship can be effected by means of at least one roller located in the stern part of said attachment and interacting with at least one vertical girder located in a respective position in the bow of said ship, and two side retainers installed at the level of the roller shaft and in turn contacting said vertical girder upon transverse movement of the icebreaking attachment and the ship in relation to each other, and at least two flexible links fastened in a symmetrical position at the starboard and port sides of the icebreaking attachment and the ship.

Other objects of the invention will be apparent from the following description in connection with several embodiments of the invention which have been shown in the accompanying drawing in which: FIG. 1 is a ship with an icebreaking attachment, according to this invention, the ship and the attachment being connected to each other by means of the coupling, guide, rollers and vertical girders;

FIG. 2 is a ship with icebreaking attachment, according to this invention, the ship and the attachment being connected to each other by means of a roller, retainers, vertical girder and flexible links;

FIG. 3 shows the attachment and ship in an undisplaced angular and vertical position; and

FIG. 4 shows the attachment in a lowered position and tilted upwardly to the right relative to the ship.

The articulated connection of the icebreaking attachment 1 (FIG. 1) carrying a vibratory mechanism 2 to the vessel 3 is ensured by means of the coupling 4 rotatably mounted on the shaft 5, said coupling being fastened in the stern of the icebreaking attachment. According to this arrangement, the center line of the shaft 5 lies in the fore-and-aft plane of symmetry of the icebreaking attachment, while the coupling 4 is in engagement with the guide 6 installed in a vertical position in

the stem of the ship 3. The movement of the coupling along the guide ensures linear movement of the icebreaking attachment and the ship in relation to each other along their respective vertical axes, while the rotation of said coupling ensures angular movements of the icebreaking attachment and ship in relation to each other with respect to their fore-and-aft axes. Angular movement of the icebreaking attachment and the ship in relation to their transverse axes can be neglected by the provision of the necessary gaps between the coupling and the guide.

Mounted at the sides of the stern of the icebreaking attachment are two rollers 7 which rotate freely on the shafts 8. These rollers take up the thrust and the torque imparted by the vessel's screws and rudders through the vertical girders 9 installed in the bow of the ship. Upon movement of the icebreaking attachment and the ship in relation to each other the rollers roll along the contact surfaces of the vertical girders.

According to another embodiment of this invention, the articulated connection of the icebreaking attachment 1 (FIG. 2) to the ship 3 is ensured by means of a roller 10 rotating on a shaft 11 fastened in the middle of the stern of the icebreaking attachment, and two retainers 12 installed on the sides of the roller, level with its axis of rotation. The roller and retainers interact with a vertical girder 13 installed in the ship's bow, a certain gap being provided between said retainers and the side surfaces of the vertical girder.

Flexible links 14 are fastened in a symmetrical position to the sides of the ship and the icebreaking attachment. The points of fastening of the flexible links are selected so that said links do not restrict the movement of the icebreaking attachment and the ship in relation to each other.

Linear movement of the icebreaking attachment and the ship in relation to each other along the vertical axes, and their angular movement in relation to their own transverse axes is ensured due to rolling movement of the roller along the contact surface of the vertical girder, while upon angular movement of the icebreaking attachment and the ship in relation to their own fore-and-aft axes the relative position of the axes of the roller and the vertical girder varies within the limits of the gaps provided between the retainers and the side surfaces of the vertical girder.

The thrust produced by the ship's screws is imparted to the icebreaking attachment, when the ship is running ahead, through the point of contact between the vertical girder and the roller, and through the flexible links, when the ship is running astern.

Owing to the articulated type of connection between the icebreaking attachment and the ship, the transmission of vibrations from the icebreaking attachment to the ship is completely obviated, and a ship equipped in this way possesses the icebreaking properties and characteristics identical to those of a specially-built uniblock icebreaker comprising a vibratory mechanism.

Employment of ships with the icebreaking attachment comprising a vibratory mechanism, using an articulated connection of said attachment to the ship ensures the most efficient operation of the available transport ships under the specific conditions of ice navigation. Furthermore, this ensures a greater scope of work during the period of prolonged navigation and reduces the necessity of employing special icebreaking ships, or renders these ships completely superfluous, which is of major importance, bearing in mind that these ships, owing to their specific design features, are low-effective for transportation duties under the conventional conditions of navigation.

It should be borne in mind that the form of embodiment of this invention shown in the appended drawings and described hereinabove covers only two preferable versions out of a number of possible versions of the invention. It will be understood that there may be different modifications and variations thereof, without departing from the spirit and scope of said invention, as will be readily understood by those skilled in the art.

We claim:

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1. A ship with an icebreaking attachment comprising a vibratory mechanism and a means connecting said attachment with the ship; said means consisting of a coupling mounted in the stern of the attachment, the axis of rotation of said coupling coinciding with the general longitudinal plane of symmetry of the attachment and the ship; a guide fastened to the ship's stem coaxially with the axis of rotation of said coupling and interacting with the latter; said coupling insuring mutual vertical displacements of the attachment and the ship and relative angular movement of the attachment and the ship

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with respect to their own longitudinal axes; said means also comprising two rollers located in the sides of the stern part of the attachment at both sides of the coupling, and two vertical girders fastened to the ship and contacting said rollers moving therealong.

2. A ship with an icebreaking attachment as claimed in claim 1, in which a clearance is provided between said coupling and guide to insure relative angular movement of the attachment relative to the ship about its own transverse axes.

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