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[54] **ARRANGEMENT IN SHIPS**
6 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **114/67**
[51] **Int. Cl.** **B63b 1/38**
[50] **Field of Search** 114/67.1, 151

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ABSTRACT: An arrangement in ships, especially in ships moving in ice filled waters, the arrangement comprising underwater/air blowing openings at the side of the ship, preferably in the bow area of the ship. By blowing air through the openings a strong upwards directed water flow is produced which at the water surface bows sidewards. This water flow can be used to facilitate the moving of the ship in ice filled waters and as an auxiliary steering means.

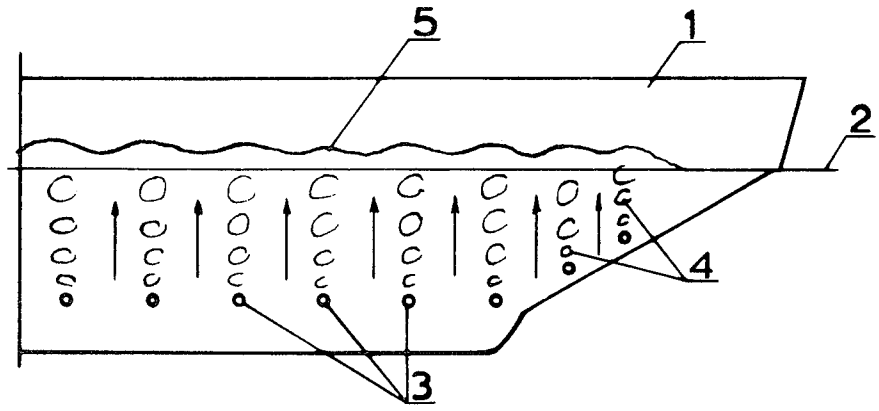


Fig 1

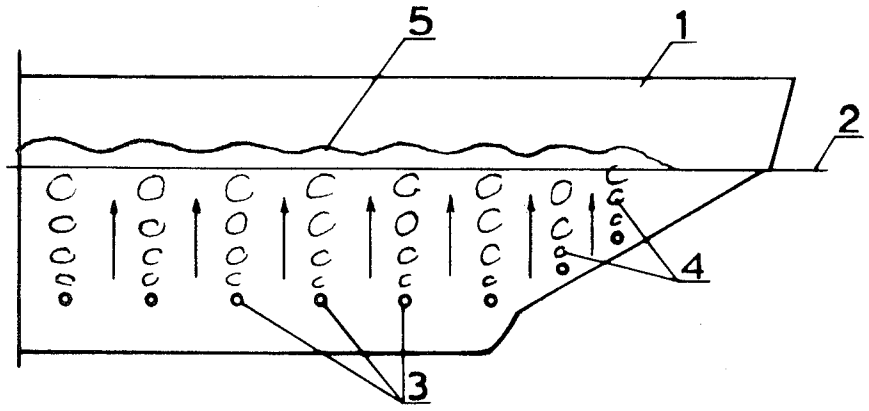
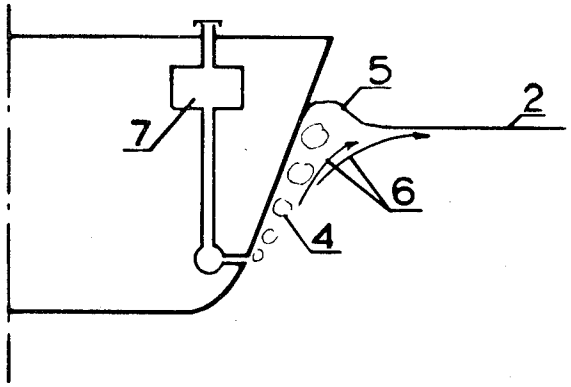


Fig 2



ARRANGEMENT IN SHIPS

ARRANGEMENT IN SHIPS

The present invention relates to an arrangement in ships, especially in ships sailing in ice filled waters.

The friction between wet ice and steel is much smaller than the friction between dry ice and steel. Bow thrusters are usually used in ice breakers in order to force water between the hull and the ice. The flow of water caused by the bow thrusters carries away loose ice blocks and ice splits and this effectively contributes to make it easier for the ship to advance in ice filled waters.

Ordinary ships do not have bow thrusters and not even all the ice breakers. The object of the invention is to provide an arrangement which is simple and relatively cheap to manufacture, and which effectively facilitates the advance of the ship in ice filled waters. The invention is characterized in that at the side of the ship, preferably in the bow area of the ship, there are underwater openings for air exhaust, through which air can be blown out to cause a strong upwards directed flow of water, which at the water surface turns away and flows sidewards from the ship. Arrangements according to the invention have proved to be effective and reliable. The speed of the air leaving the openings does not need to be high, because the desired flow of water arises when the air bubbles flow upwards during expansion. Thus the air pressure in the exhaust openings only needs to be a little higher than the water pressure outside the openings, that is the overpressure of the air is about half an atmosphere if the openings are at a level of 5 meters below the water surface. The air bubbles cause an upwards directed flow of water which at the water surface close to the ship, forms a ridge of water from which the water flows sidewards away from the ship. Thus waters penetrates effectively between the ice and the ship, and pushes the ice blocks away from the ship. As the obstructing effect of the ice is highest at the bow area of the ship, the air blowing openings according to the invention are preferably situated in the bow area of the ship, but especially if the ship is intended to sail very much in ice filled waters, it is advisable to provide air blowing openings along a large part of the side of the ship. In this way the advantage is obtained, that the water flow directed aside from the ship keeps the ice away from the ship along its whole length. If the ship is an ice breaker, the loose ice blocks are forced against the sides of the channel broken up in the ice so that it is made free from ice and remains free at least long enough for the ships following the ice breaker to advance in substantially free water.

If the air blowing openings are situated too close to the water surface the useful effect is diminished. In a preferred embodiment of the invention the air blowing openings are situated on a level, which is at least 30 percent, preferably at least 50 percent of the draft of the ship.

An arrangement according to the invention also gives the advantage that it can be used as an auxiliary means for the steering of the ship, for instance in harbors. Blowing air only at one side of the ship results in a side force in the opposite direction. Especially if air is blown at the bow part of the ship the arrangement according to the invention can be used as an auxiliary steering means, substantially with the same effect as a steering propeller arranged in a cross-tunnel. When an arrangement according to the invention is used as steering means, the necessary power may be taken from the main machinery of the ship, because in such a situation most of the power of the main machinery is available.

An embodiment of the invention will be described hereafter with reference to the attached drawing, in which:

FIG. 1 shows the bow part of a ship seen from the side and

FIG. 2 a cross section of one-half of the ship.

In the drawing 1 indicates the hull of the ship, 2 the water surface and 3 air blowing openings according to the invention. The air leaving the openings 3 flows upwards in the form of bubbles 4. At the same time the bubbles expand and cause a strong flow of water in their flow direction. This water flow forms a ridge 5 of water close to the ship and turns away sidewards as shown by the arrows 6. Pressure air is supplied to the air blowing system by a compressor 7.

The overpressure of the compressor does not have to be very high. It is sufficient that the air can flow out from the openings. If an arrangement according to the invention is used in an ice breaker, large volumes of air are needed. If air is blown at a level of about 5 meters below the water surface, a ridge of about half a meter in height and over 30 meters in length arises on both sides of the ship by blowing about 30 $m.^3/s$ of air. The average speed of the water flowing sidewards is then about 1.5 m./s. If a water ridge of only about 25 cm. height is to be obtained, in the said example an air flow of about $6m.^3/s$ is sufficient.

When an arrangement according to the invention is used as a steering means, the arrangement produces a side force of about 5 kp per horse power driving effect.

The invention is not limited to the illustrated embodiment, but modifications of the invention are feasible within the scope of the following claims.

We claim:

1. A ship comprising a hull with a bow portion, said bow portion having a plurality of underwater openings along both sides in a substantially horizontal alignment below the waterline and means for discharging compressed air through said openings, all of said openings being submerged below the waterline by a distance which is at least 30 percent of the draft of said hull, the dimensions and number of said openings and the output of said air discharging means being such that air is blown through said openings at a volumetric rate sufficient to cause an upwardly directed flow of water along the side of said ship to produce a substantial ridge of water at the water surface along the side of said hull and thus generate a water flow which moves laterally away from the side of said hull whereby to reduce resistance to advancement of the ship in ice filled water.

2. A ship according to claim 1, in which said openings are provided in the bow part of said hull.

3. A ship according to claim 2, comprising air exhaust regulating means operable so that air can be blown through said openings from one side of said hull only.

4. A ship according to claim 1, in which the dimensions and number of said openings and the output of said air discharging means are such that said ridge reaches a height of from 25 to 50 cm. above the water level.

5. A ship according to claim 1, in which said openings are at a level below the water surface which is at least 50 percent of the draft of said hull.

6. A ship according to claim 1, in which said ship has drive machinery therefor and said air discharging means comprises a compressor and means for transmitting driving power to said compressor from the drive machinery of the ship.