



ICEBREAKER PLOWSHARE



2021

The field of the technology to which the invention relates

The invention relates to the needs to open frozen waterways with the help of an innovative technical addition for ice breakingcutting. Plowshare is placed on the bow of existing and future icebreakers, with the possibility of the installation on the usual ships.



The plowshare is equipped with the chambers, which are filled with the adjusting air pressure, which helps to cut through ice and makes the waterway easily navigable by ships throughout the whole year.

In a way, that the use of innovative plowshare will significantly reduce the required power of propellers and engines on the existing icebreakers compared to today's floating ice breakingcrushing technology. Innovative ice plowshare with trapped air under the ice gets support in the water so that the parts of the blade cause planned linear and secondary ice cracking of any thickness. Among other things, a new type of icebreaker can work in all areas of the planet, where necessary, without the possibility of getting stuck in the ice. An innovative icebreaker would have a lower fuel consumption with a significantly greater effect of breaking the ice. The ice plowshare is suitable to be placed on the new ships and already existing ones that need to sail through ice-covered waterways. Ships equipped with innovative plowshare do not have the need for an icebreaker when the ice is not too thick. Then, cargo ships and military ships are "cutting" themselves the ice through waterways, and allow the convoy of ships to follow them.

Technical problem

The technical problem which is solved by using the invention is a better use of current icebreakers, favorable and more efficient construction of future icebreakers and ships. Instead of limited navigation time during the long period of the year, it is possible to secure the North Sea Route, through and on the edge of the Arctic, with a navigable waterway throughout the year for the ships on which this innovative solution will be applied. The Arctic's area rich in mineral resources and energy resource sites will now be available for commercial exploitation with secured transport throughout the year. The known solutions of today's icebreakers use primarily the huge engine power to drive propellers, then uses the reinforced ship hull, especially the reinforced bow of the ship. Therefore, today's icebreakers use the technology of the drive power and the weight of the front part of the icebreakers hull for the opening of the waterway.

An example of the use of today's icebreaker, weather conditions are getting worse and the ice is thickened under the conditions of colder weather, naturally, there are deformities with the deposition of underwater iceblocks where the ice becomes even thicker. The icebreakers can unexpectedly get stuck on that route, so even they need help in rescuing. The illustrated innovation uses a self-adjusting plowshare with lower power output on the propeller so that the remaining additional power is at the ship's disposal to have the ability to further push the plowshare beneath the ice in front of the ship. Then like a razor blade, the innovative platform on the secondary parts of the surface breaks the floating ice and allows the ship to have a constant and smooth sailing.

The current icebreaker suppresses the ice from the top to the water, this way it encounters the huge resistance of dense water that holds the thick icebergs like support, which requires the use of the huge icebreaker's strength to break it. Innovative technology has adopted a reverse principle of using natural elements. Such dense water with the help of a chamber filled with air is now positive support, which, by means of the direction and action of the small force of the execution, cuts the ice cover into the parts, and in the direction towards the air. Like the action of the wedge, where the air does not keep the surface of the ice to remain in place.



The achieved cohesion of the relationship and the connection of ice with water through the innovative technological application is linearly and gradually splitting. The ice is gradually lifted and easily breaks further by passing through the conical edge of the plowshare. Additionally, with the help of the plowshare platform and the use of the necessary spot points, where the high-intensity pressure forces are operating, with the positioned vibrating or linear rollers, the ice breaks into necessary pieces and disposes of the waterway. By using this technology we use the characteristics of the ice position, so that in its position it would be brittle, and would easily break down.

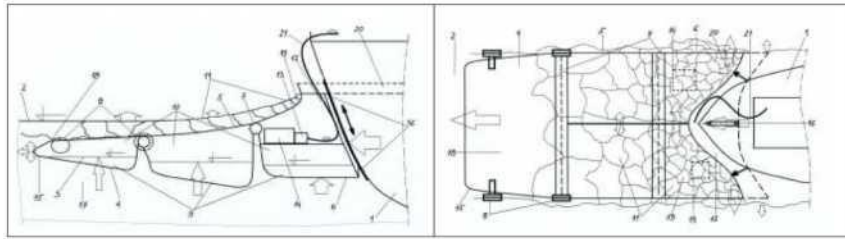
Description of the essence of the invention

The icebreaker is a name for a special type of ship, whose purpose is to break the ice in order to open the waterways. The icebreaker in order to break the huge thickness of the ice has a particularly solid hull and a powerful engine so that the bow of the ship can go through the ice. Respectively, a powerful engine raises a part of the bow to the ice surface so that, due to the pushing force and the massive pressure of the ship, the ice breaks under the ship's bow. The current technological use of icebreakers has a high construction cost, and high running and maintenance costs. Some of the types of icebreakers also use nuclear power, with the aim and the huge amount of energy necessary for breaking thicker layers of ice. In certain parts of the planet when there are low temperatures and the nuclear icebreaker remains helpless against the thicker layer of ice.

The presented innovation is a simple technical solution that can be equipped with the state-of-the-art today's technology. By setting up a flexible plowshare with air chambers, we are getting a unique platform, a working machine for crushing the ice with the help of a lifting force.

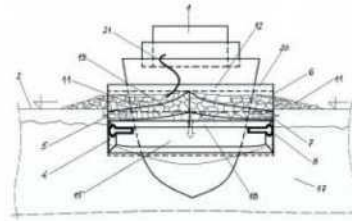
Supported by the balance of water and air, maintaining the required pressure in separate chambers that lie below the surface of the ice. This way, a small force is required to push the innovative plowshare with the necessary equipment in front of the ship, which the ship pushes to enable it to navigate the waterway. A similar example is a riverboat that pushes the river barges in front of itself, the water resistance is then low with a small water gauge of the plowshare, where the resulting flow of water follows the passing of the ship that pushes it. Innovative plowshare is mainly made of metal, placed on the bow of the ship, designed with flexible floating elements that efficiently goes under the uneven ice structure, then breaks it and removes it on the side for the ship to pass. The speed of the ship's passage is corrected in relation to the thickness of the ice and the resistance which the boat encounters. Where the planned usage values of the innovative plowshare are described in the text below.





Picture No1

Picture No2



Picture No2

The chambers on the plowshare are closed containers that are interconnected with each other by the axis, which stiffens them in the direction of lateral movement, while they are flexible in the direction of up and down movement. The chambers are adjusted and filled with air as needed, depending on the thickness of the ice and the ship's cargo weight that makes a certain depth of gauge. The chambers are thus set by the ratio of air pumped to the chambers, respectively the ballast, the balance of water and air in them, where the air from the bottom makes pressure on the surface of the ice breaking it with the buoyancy force. The chambers are pumped with air with a compressor located in a machine room on a plowshare, which is operated from the position on the ship where certain control mechanisms are located in order to operate the plowshare.

The innovative plowshare is placed at a certain depth in front of the bow, sufficient to secure a platform that discards the broken ice at the side of the ship. The depth of the plowshare gauge is, as needed, not deeper than necessary to create unnecessary water resistance when moving. On the front of the plowshare, there are protected cameras and sonars for monitoring the lower layer ice configuration and measuring its thickness. In order to keep the operating parameters in line with the speed of the boat and the type of ice that is breaking, the front of the plowshare is getting under the ice, breaking it with the help of vibrating rollers and transporting it to the middle part of the plowshare where it breaks further on the platform's surface. Such required crushed ice with the aid of side buffers and inline rollers and ship's movement force is dropped on the ice surface, next to the side of the ship's route.

The machine room is located inside the rear part of the plowshare, allowing the equipment to be installed to balance the operation of the plowshare in relation to the ship's speed and breaking of a particular type of ice. Inside it houses a mechanical drive with operating parameters, which are controlled via managing mechanisms placed on board of the ship. Connected via a cable, followed by another cable for delivering the necessary electricity from the ship. An instance of accommodating a compressor that supplies air chambers and can provide compressed air to the vibrating machines that would occasionally work on the ice surface.

Distanced a couple of tens of meters of intermedium between the ship, bridged by a metal structure placed in the water beneath the ice surface. The platform with the chamber is additionally equipped with rollers, this way it underlines under the ice then breaks it and shifts it over into the interspace towards the ship. The interspace is actually a created water passage, now sprinkled with fragments of broken ice from the innovative plowshare, over which goes the ship. The ship then with its bow and hull further breaks and pushes the icebergs and ice fragments into the water and below the surface which this way remain on the ship's side, opening the waterway for other ships.

Innovative plowshare shifts most of the broken ice to the surface of the ice, while the existing icebreaker mostly pushes broken ice below the ice surface. If needed, special metal structures such as routers or profiled plows can contribute to pushing crushed ice beneath the surface of the ice.

The current navigation of icebreakers is envisaged under certain conditions when they are conditioned to navigate through mapped waterway to avoid the thicker ice zone loaded with icebergs, which can get even the icebreaker stuck. It is a constant stressful situation for the crew operating the ship, requiring a certain working and technical efforts, whereby applying this innovative solution that breaks ice under any weather conditions will ease such situation.





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