Coaxial counter-rotating propeller for ships, nuclear-powered ships and submarines.

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Annotation. The article is devoted to coaxial counter-rotating propeller propellers equipped with a matching system associated with the damper device of the rear propeller shaft, absorbing and significantly reducing the energy of the swirling jet behind the front propeller shaft, oscillations, vibrations, cavitations and reducing their amplitude for ships, nuclear-powered submarines and submarines. Coaxial propellers in the opposite direction of rotation of the propellers work together with the world's first modular electric machine, Belashov, in which many multi-turn rotor windings, without changing the direction of current movement in the conductors, pass through many magnetic systems without any electronic or mechanical switching devices. Modular electric machines can be manufactured with a lightweight titanium rotor, have forced air cooling and have a single module diameter of one to ten meters. The stator excitation system can be made of electromagnets or permanent magnets and their combination. Electric machine modules have a large torque on the rotor shaft and are well regulated by current. Any number of modules of a given electrical machine can be connected or disconnected both electrically and mechanically from the overall assembly, which provides these electrical machines with great reliability, quick repair and replacement of failed modules.

Key words: counter-rotating coaxial thrusters, the world's first electric machine, damper device, shipbuilding.

A Belashov modular electric machine is known, which without a collector, using a control system for working rows of multi-turn windings connected to an electronic commutator, rotates the rotor of the electric machine relative to the magnetic systems of the stator. See the patent of the Russian Federation "Belashov brushless universal electric machine" № 2130682 KL H 02 K 23/54, 27/10 - analogue.

The world's first electric machine, Belashov, is known to have many multi-turn windings that pass through many excitation systems without any switching devices. See description of application for invention № 2005129781 dated September 28, 2005 - analogue.

A known blade propeller of a vessel contains coaxial counter-rotating propellers. See the patent of the Russian Federation "Vessel blade propulsion device" № 2191136 KL B 63 N11/10 KL, B 63 N1/20 - prototype.

Figure 1 shows a general view of the coaxial propulsion unit of counter-rotating propellers operating on Belashov electric machines.

Figure 2 shows a type of the world's first electric machine Belashov.

Figure 3 shows a section A-A of the world's first electric machine.

Figure 4 shows a section B-B of the world's first electric machine.

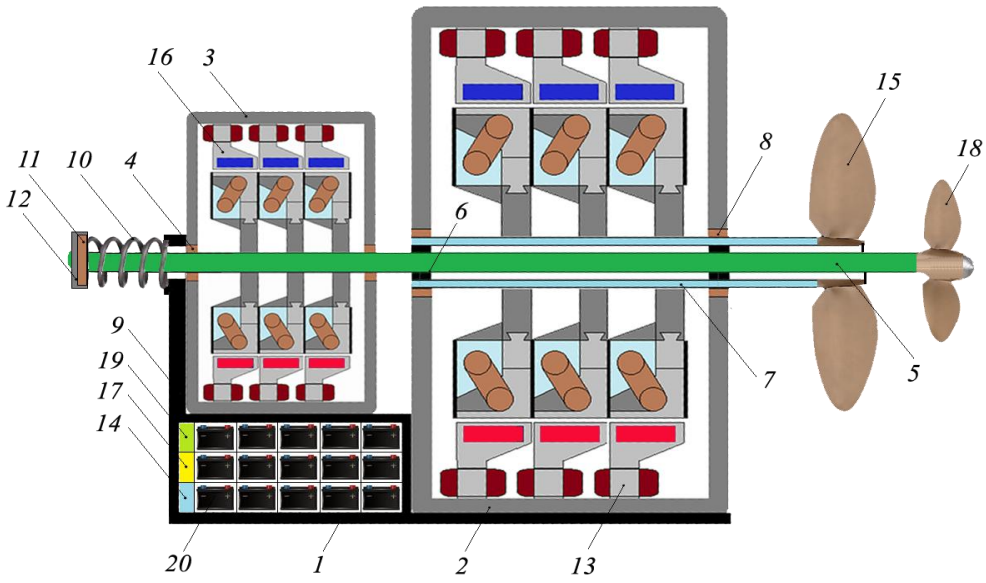

Figure 1

General view of the coaxial propeller of counter-rotating propellers, Figure 1, contains a base 1 with a Belashov modular electric machine 2 and a Belashov modular electric machine 3. The modular electric machine 3 interacts with the shaft 5 through rolling or sliding elements 4 and through rolling or sliding elements 6 interacts with a hollow shaft 7, which, through rolling or sliding elements 8, interacts with the body of the electric machine 2. The stand 9 of the base 1 is adjacent to the electric machine 3 and contains a system damping device 10 made of a spring interacting with the support bearing 11, rigidly connected through the support washer 12 attached to the shaft 5 of the electric machine 3. A plurality of modules 13 of the electric machine 2 have a control and regulation system 14 for the front propeller 15. A plurality of modules 16 of the electric machine 3 have a control and regulation system 17 for the rear propeller 18. The front propeller 15 and the rear The propeller 18 has a control, monitoring and regulation system 19. The tracking and regulation system 19 controls the operation of the electric machine 2 and the electric machine 3, which are powered by batteries located in compartment 20.

The coaxial counter-rotating propeller operates as follows. The blade 18 rotating as part of the rear propeller is affected by centrifugal and hydrodynamic forces emanating from the front propeller 15. The shaft 5 of the rear propeller 18 is connected to a damper device that absorbs and significantly reduces the energy of the swirling jet behind the front propeller shaft 15 and eliminates vibrations, vibrations, cavitations around propellers and reduces their amplitude and noise. Moreover, the rotation speed of the front propeller 15 and the rear propeller 18 is regulated by a tracking and control system 19, which controls the operation of the electric machine 2 and the electric machine 3. The electric machine 2 and the electric machine 3 are powered by batteries located in compartment 20. Damper device matching system 10 automatically sets the distance between the front propeller 15 and the rear propeller 18 to absorb the energy of the swirling jet and eliminate oscillations, vibrations, cavitation and reduce noise from the propellers. For example, in transient modes for submarines located at different depths and moving at different speeds. Moreover, it must be especially emphasized that Belashov's modular electric machines can be manufactured for ships, nuclear-powered ships and especially submarines, since they can contain a forced cooling system and be made with a lightweight titanium rotor and have a diameter of one module from one to ten meters. The stator excitation system can be made of electromagnets or permanent magnets and their combination. Electric machine modules have a large torque on the rotor shaft and are well regulated by current. Any number of modules of this electric machine can be turned on or off both electrically and mechanically from the overall assembly, which provides these electric machines with great reliability, quick repair and replacement of failed modules in field conditions.

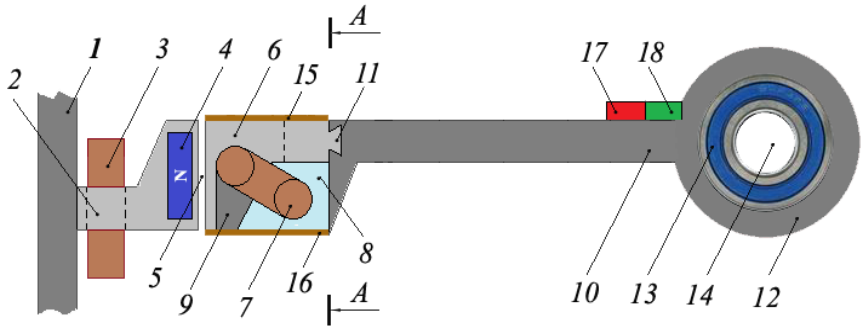

Figure 2

The invention is based on varieties of the world's first electric machine, Belashov Figure 2, contains a housing 1, inside of which, along the inner part of the circle, there are many stator excitation systems 2 made of electromagnets 3 or permanent magnets 4 and their combination. The excitation system of the stator 2 interacts through the air gap 5 with

multiple sections of the magnetic cores of the rotor 6. Each section of the rotor 6 has a multi-turn winding 7, which with one base is enclosed in the magnetic core 6, and with the other base it is enclosed in a shielding braid and located at a distance from the magnetic core in the cooling system and fixation 8. To seal the multi-turn winding 7, each section of the magnetic core 6 has a magnetically conductive insert 9 for better closure of the magnetic fluxes emanating from the stator excitation system 2. Rigidity 10 is connected to the magnetic core 6 by means of a fastening device 11, and to the hoop 12 inside which the sliding system is located or rolling element 13 interacting with the rotor shaft 14. Moreover, it must be especially emphasized that for the survival of the electric machine in extreme conditions, each section of the magnetic circuit 6 is separated by a dielectric insert 15, a dielectric insert 16 and is equipped with a system for electrical disconnection 17 or mechanical disconnection of each module 18 from the general assembly of the electrical machine direct current.

Figure 3 shows a section A-A of one section of a DC electric machine containing a stator coil with a multi-turn winding 3 to create a magnetic field of the excitation system having a north pole 20 and a south pole 21.

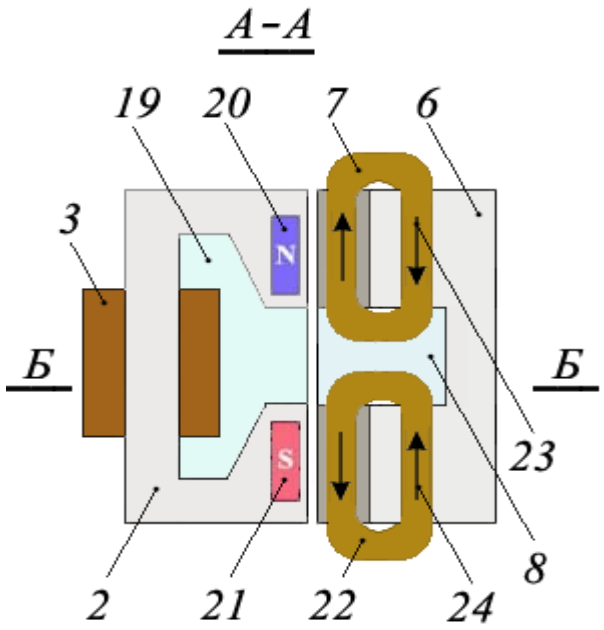

Figure 3

The magnetic core of the rotor 6 contains a multi-turn rotor winding 7, which is wound clockwise 23, one arm of which is located inside the magnetic core 6, and the second arm of the multi-turn rotor winding 7 is located in the air gap of the cooling and fixation system of the multi-turn winding 8. The magnetic core of the rotor 6 contains a multi-turn rotor winding 22, which is wound counterclockwise 24, one arm of which is located inside the magnetic core 6, and the second arm of the multi-turn winding of the rotor 22 is located in

the air gap of the cooling and fixing system 8. For Belashov electric machines, the rotor cooling system 8 is connected to the stator cooling system 19 and can be natural or forced and operate from an external source of compressed and cooled air.

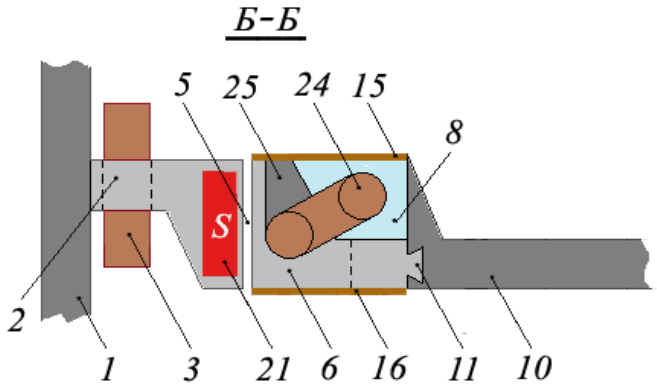

Figure 4

In Figure 4 shows a section B-B of one section of a DC electric machine containing a housing 1, inside of which, along the inner part of the circle, there are many stator excitation systems 2 made of electromagnets 3 or permanent magnets 21 and their combination. The excitation system of the stator 2 interacts through the air gap 5 with multiple sections of the magnetic cores of the rotor 6. Each section of the rotor 6 has a multi-turn winding 24, which with one base is enclosed in the magnetic core 6, and with the other base it is enclosed in a shielding braid and located at a distance from the magnetic core in the cooling system and fixation 8. To seal the multi-turn winding 24, each section of the magnetic core 6 has a magnetically conductive insert 25 for better closure of the magnetic fluxes emanating from the stator excitation system 2. Rigidity 10 is connected to the magnetic core 6 by means of a fastening device 11.

The world's first modular electric machine Belashov works as follows.

Each section of the world's first modular electric machine is connected to a plurality of coils 3 of the stator excitation system 2. The stator excitation system of the module creates a magnetic flux that leaves the north pole 20 and through the magnetic circuit 6 comes to the south pole 21 of the stator excitation system 2. All multi-turn stator windings connected to a direct current source that does not change its direction of current in the conductor when the electrical machine is operating. Next, the magnetic flux through the air gap 5 crosses the multi-turn winding 7, wound clockwise 23, located in the magnetic field of the magnetic circuit 6. After the magnetic field lines cross the conductor 7 located in the magnetic field, a buoyancy force arises, which acts on the conductor 7 according to the left-hand rule. If the left hand is positioned so that the magnetic field lines enter the palm perpendicular to it, and

the four fingers are directed along the current, then the thumb set at 90° will show the direction of the force acting on the conductor. Moreover, it must be especially emphasized that the magnetic flux does not cross the second arm of the multi-turn winding 7, which is located in the screen of the cooling and fixation system 8 and is not affected by the buoyant force. Next, the magnetic flux crosses the multi-turn winding 22, wound counterclockwise 24, located in the magnetic field of the magnetic circuit 6. After the magnetic field lines cross the conductor 22 located in the magnetic field, a buoyancy force arises, which acts on the conductor 22 according to the left-hand rule. If the left hand is positioned so that the magnetic field lines enter the palm perpendicular to it, and the four fingers are directed along the current, then the thumb set at 90° will show the direction of the force acting on the conductor. Moreover, it is necessary to especially emphasize that the magnetic flux does not cross the second arm of the multi-turn winding 22, which is located in the screen of the cooling and fixation system 8, and it is not affected by the buoyancy force, which coincides in direction and strength with the multi-turn winding 7.

In conclusion, we can say that when Belashov first electric machine in the world operates, inside all the multi-turn windings of the rotor and stator, the current movement in the conductors occurs in one direction, which does not change its direction without any switching devices. In extreme conditions, the cooling system for multi-turn rotor windings 8 and multi-turn windings 24, as well as multi-turn stator windings 3 may contain a device for forced cooling of them with compressed cool air.

Reference materials:

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