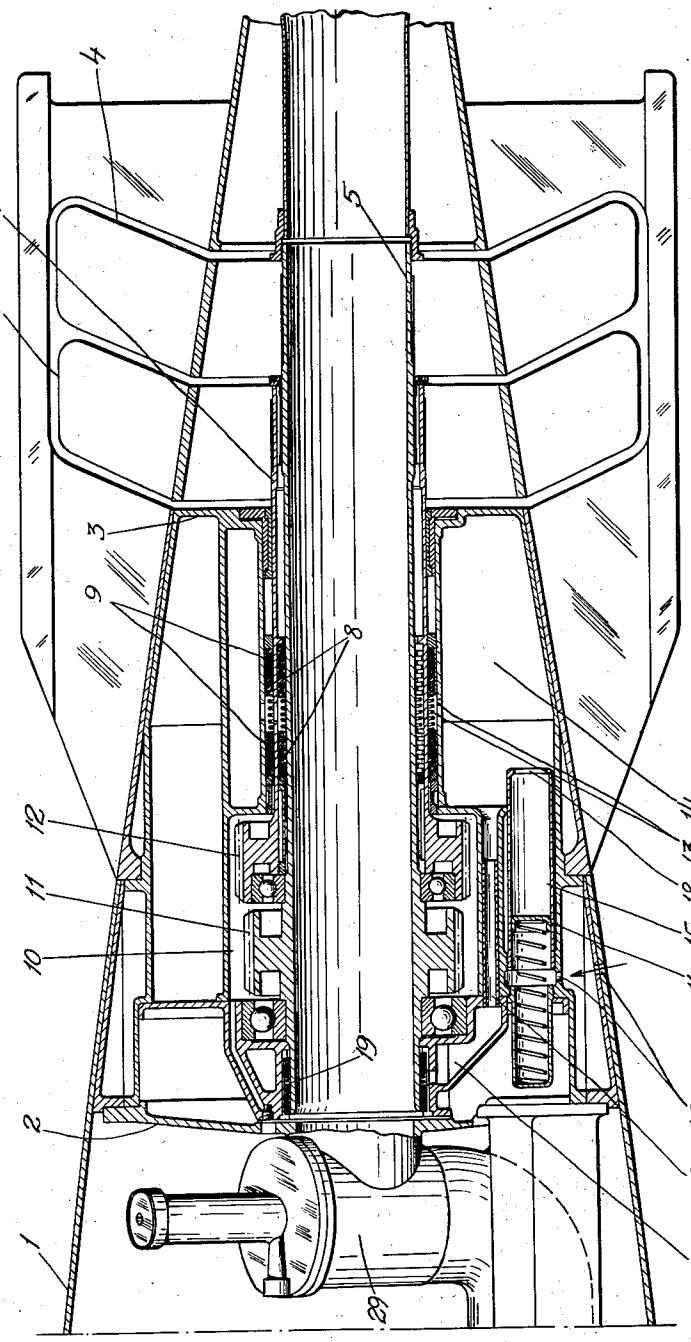
Dec. 4, 1934. R. NILSSON 1,983,392

SHAFT PACKING

Filed June 30, 1931 2 Sheets-Sheet 1

Fig. 1



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SHAFT PACKING

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Fig. 2

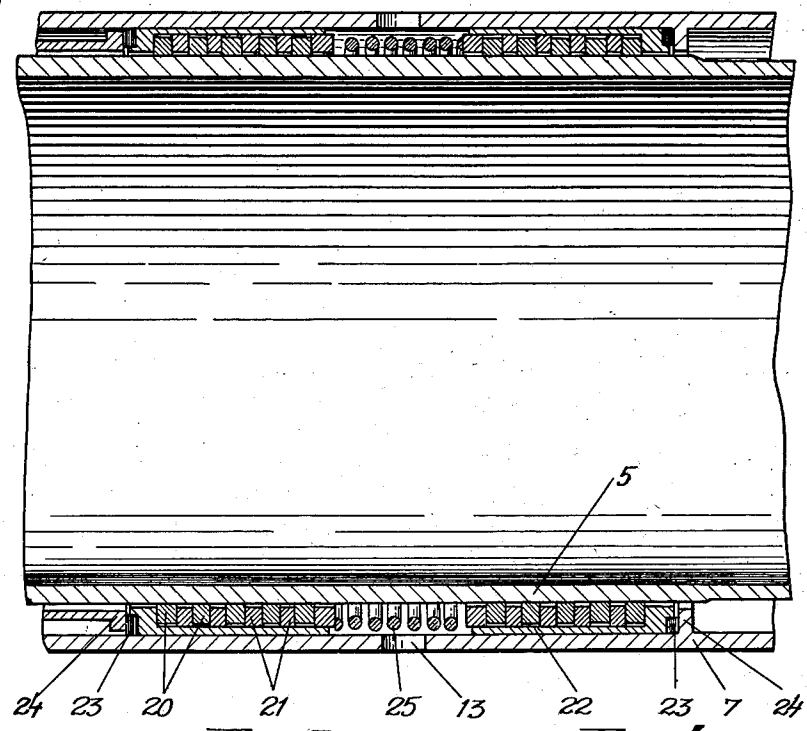


Fig. 3

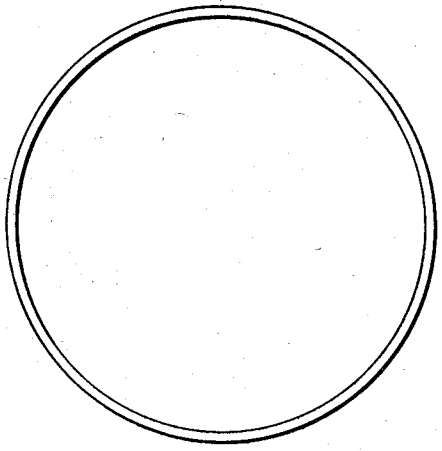
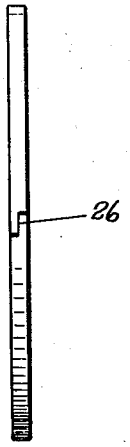


Fig. 4



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UNITED STATES PATENT OFFICE

1,983,392

SHAFT PACKING

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Application June 30, 1931, Serial No. 547,809
In Germany July 3, 1930

5 Claims. (Cl. 286—9)

This invention relates to shaft packings and particularly has reference to packings for shafts extending from vessels, and more particularly to torpedo shaft packings. The invention is, however, also applicable to shafts of other kinds and it is possible to prevent leakage of gases as well as of liquids by means of packings according to the invention.

According to the invention a number of ring members are placed beside each other in axial direction, the outer and inner circumferential surfaces of which alternately are in contact with different elements, and the side surfaces of which are brought tightly together due to an axial pressure on the ring members.

The nature of the invention will become apparent from the following description taken in connection with the accompanying drawings showing a torpedo designed in accordance with the invention and forming part of this specification.

Of the drawings:

Fig. 1 is a cross-sectional centerline view of the stern portion of a torpedo provided with packings according to the invention;

Fig. 2 is a cross-sectional view, on a larger scale, of a part of the torpedo including a packing; and

Figs. 3 and 4 show in external views one of the packing rings.

In Fig. 1 the interior 1 of the torpedo is closed at the rear by means of bulkheads 2, 3. The torpedo has two propellers rotating in opposite directions. The rear propeller 4 is mounted on the hollow inner shaft 5 and the fore propeller 6 on the shaft 7 surrounding the inner shaft. Both shafts extend through the stern bulkhead 3. In order to prevent water from penetrating into the interior of the torpedo, a packing 8 according to the invention is arranged between the shafts and a packing 9 is arranged between the outer shaft and the stationary parts of the torpedo. Another packing 19 of the same kind is arranged in immediate proximity to the bulkhead 2. The object of this packing is to prevent water from penetrating through the hollow inner shaft into the gear compartment 10 in which pinions 11 and 12 are mounted on shafts 5 and 7, respectively.

Before describing the packings in detail, it should be noted that the general arrangement is such that any water which possibly may penetrate through the rear halves of the packings 8 and 9 passes through openings 13 between the halves of the packings into an oil containing chamber 14 and sinks to the bottom of the chamber, thus forcing a quantity of oil to leave the chamber through one of the packings. A cylinder 15 in which a spring-loaded piston 16 is arranged, communicates on one side of said piston with the outside water through openings 17 and on the other side with the chamber 14 through an opening 18. By this arrangement a counter pressure is set up in chamber 14 which varies with the pressure with which the outside water at different positions of depth of the torpedo tries to penetrate through the packings into the interior of the torpedo. This counter pressure which counteracts the penetration of the outside water, is always somewhat higher than the outer water pressure. This is so because the pressure of the water tending to leak pass the packing is measured by a column of water extending from the packing to the surface of the water, while the pressure of the liquid within chamber 14 tending to leak out is measured by a column of water extending from the packing to the surface, which is the same as the first mentioned column and hence the two columns counterbalance each other, plus a column of water extending from the packing to the piston 16 at the bottom of the torpedo minus a column of oil of equal height. Inasmuch as the specific gravity of the oil is less than that of the water, the column of water outside the torpedo acting against piston 16 overbalances the column of oil inside and tends to force the oil out through the packings around the shafts.

The hollow inner space of the inner propeller shaft 5 is connected to the inner space of the torpedo through a valve 29 or some similar device of such kind that it prevents the entrance of water into the torpedo but on the other hand allows the exhaust gases from the driving machine to escape with as small resistance as possible through the inner shaft.

Fig. 2 illustrates the packing 8 between the shafts 5 and 7 on a larger scale. The leakage of water between the two shafts is prevented by ring members 20 and 21. These rings are made of resilient material and are split and their ends slotted so as to overlap, as is shown at 26 in Fig. 4. The inner diameter of rings 20 is such that the rings are expanded somewhat by shaft 5 and hence the inner surface of the rings are pressed tightly against the shaft, and leakage therebetween is prevented. The outer diameter of rings 21 is such that the rings are contracted somewhat by sleeves 22 secured to the outer shaft 7 and hence the outer surface of the rings

is pressed tight against the sleeves, whereby leakage therebetween is prevented. The sleeves do not, however, constitute any essential part of the invention and may therefore, if desired, be omitted, in which case the rings 21 are in direct contact with the shaft 7. In the embodiment shown packing rings 23 are provided between the sleeves 22 and projections 24 against which the sleeves are pressed. The projections 24 may be made integral with the shaft 7 or may be connected to it in some other way.

The rings 20 and 21 are arranged in two groups and between the same is provided a spiral spring 25 which acts in an axial direction on the rings and keeps their side surfaces yieldingly pressed against each other. By this arrangement a very good packing is obtained because any water penetrating from the outside is forced to pass through the spaces between the rings 20 and the sleeve 22 and between the rings 21 and the inner shaft 5, as well as between the side surfaces of all rings tightly pressed together. The rings 20 and 21, being slotted after the manner of piston rings as at 26 water cannot leak around the split ends of the rings. The manner of forming the rings and the slots 26 is of no essential importance. It is, however, suitable to give the rings different inner and outer diameters in such manner that the rings 20 after being mounted will be in tight alignment with the shaft 5 and the outer surfaces of rings 21 in tight alignment with the sleeves 22 or the outer shaft 7.

If the shafts rotate with a high number of revolutions, the pressure pressing the rings 20 against the inner shaft 5 with which they are rotating, is decreased by the centrifugal force, whereby the friction between the shaft and the rings during operation is diminished, which circumstance, however, has no influence on the effectiveness of the packing, as on rotation of the shafts a decrease of pressure exists at the stern ends of the shafts, so that the outside water has less tendency to penetrate into the torpedo than would be the case if the torpedo were submerged in the water with its shafts stationary.

The packings according to the invention, of course, may prevent the penetration of water from without as well as the leakage of oil from the interior of the torpedo outwardly.

As above mentioned, leakage water after passing the rear half of the packing sinks through the opening 13 to the bottom of the oil chamber 14, thus raising the oil pressure in this chamber and forcing a quantity of the oil, corresponding to the inflowing water, to enter through the half of the packing facing the gear case 10 where it contributes to the oiling of the gearing. This applies also to the packing 19, the oil chamber 27 of which is located below and is connected through a pipe 28 to oil chamber 14.

The manner in which the different packing rings are pressed axially against each other is of no vital importance. Instead of the springs shown in the above described embodiment, an axial pressure may, for instance, be obtained from a torpedo chamber under pressure, for instance an oil chamber or the like. If desired, a pressure may be set up in chamber 14 itself which pressure at the same time axially presses the packing rings together.

The arrangement for automatically equalizing the pressure may, for instance, consist of a membrane or some similar device instead of the piston 16. When a piston is used, the piston spring only serves to equalize the friction of the piston in the cylinder.

What I claim is:

1. In an under-water device of the class described, walls forming a machinery compartment, walls forming an oil reservoir, a cylindrical member extending from said machinery compartment through said reservoir, a rotatable shaft extending from within said compartment through said cylindrical member, said cylindrical member being formed with an opening therethrough into said reservoir, and packing means for substantially preventing passage of fluid between said shaft and said cylindrical member, said means comprising a plurality of resilient rings slidably engaging said shaft, a plurality of resilient rings arranged alternately with respect to the first mentioned rings and slidably engaging said cylindrical member, the rings being arranged in two groups one on either side of said opening and spring means between the two groups for pressing the radial faces of the rings together.

2. In an under-water device of the class described, walls forming a machinery compartment, walls forming an oil reservoir, a cylindrical member extending from said machinery compartment through said reservoir, a rotatable shaft extending from within said compartment through said cylindrical member, said cylindrical member being formed with an opening therethrough into said reservoir, and packing means for substantially preventing passage of fluid between said shaft and said cylindrical member, said means comprising a plurality of resilient rings slidably engaging said shaft, a plurality of resilient rings arranged alternately with respect to the first mentioned rings and slidably engaging said cylindrical member, the rings being arranged in two groups one on either side of said opening and spring means between the two groups for pressing the radial faces of the rings together, said reservoir extending an appreciable distance below said cylindrical member and providing a space wherein water leaking past said packing means and through said opening may accumulate.

3. In an under-water device of the class described, walls forming a machinery compartment, walls forming an oil reservoir, a cylindrical member extending from said machinery compartment through said reservoir, a rotatable shaft extending from within said compartment through said cylindrical member, said cylindrical member being formed with an opening therethrough into said reservoir, packing means for substantially preventing passage of fluid between said shaft and said cylindrical member, said means comprising a plurality of resilient rings slidably engaging said shaft, a plurality of resilient rings arranged alternately with respect to the first mentioned rings and slidably engaging said cylindrical member, the rings being arranged in two groups one on either side of said opening and spring means between the two groups for pressing the radial faces of the rings together, said reservoir extending an appreciable distance below said cylindrical member, and means for communicating pressure from the surrounding water to the lower part of said reservoir.

4. In an under-water device of the class described, walls forming a machinery compartment, walls forming an oil reservoir, a cylindrical member extending from said machinery com-

partment through said reservoir, a rotatable shaft extending from within said compartment through said cylindrical member, said cylindrical member being formed with an opening therethrough into said reservoir, packing means for substantially preventing passage of fluid between said shaft and said cylindrical member, said means comprising a plurality of resilient rings slidably engaging said shaft, a plurality of resilient rings arranged alternately with respect to the first mentioned rings and slidably engaging said cylindrical member, the rings being arranged in two groups one on either side of said opening and spring means between the two groups for pressing the radial faces of the rings together, said reservoir extending an appreciable distance below said cylindrical member, a cylinder communicating at one end with the lower part of said reservoir and at the other end with the surrounding water, and a piston reciprocably mounted in said cylinder.

5. In an under-water device of the class described, walls forming a machinery compartment, walls forming an oil reservoir, a cylindrical member extending from said machinery compartment through said reservoir, a rotatable shaft extending from within said compartment through said cylindrical member, said cylindrical member being formed with an opening therethrough into said reservoir, and packing means for substantially preventing passage of fluid between said shaft and said cylindrical member, said means comprising a plurality of resilient rings slidably engaging said shaft, a plurality of resilient rings arranged alternately with respect to the first mentioned rings and slidably engaging said cylindrical member, the rings being arranged in two groups one on either side of said opening and means for pressing the radial faces of the rings together.

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